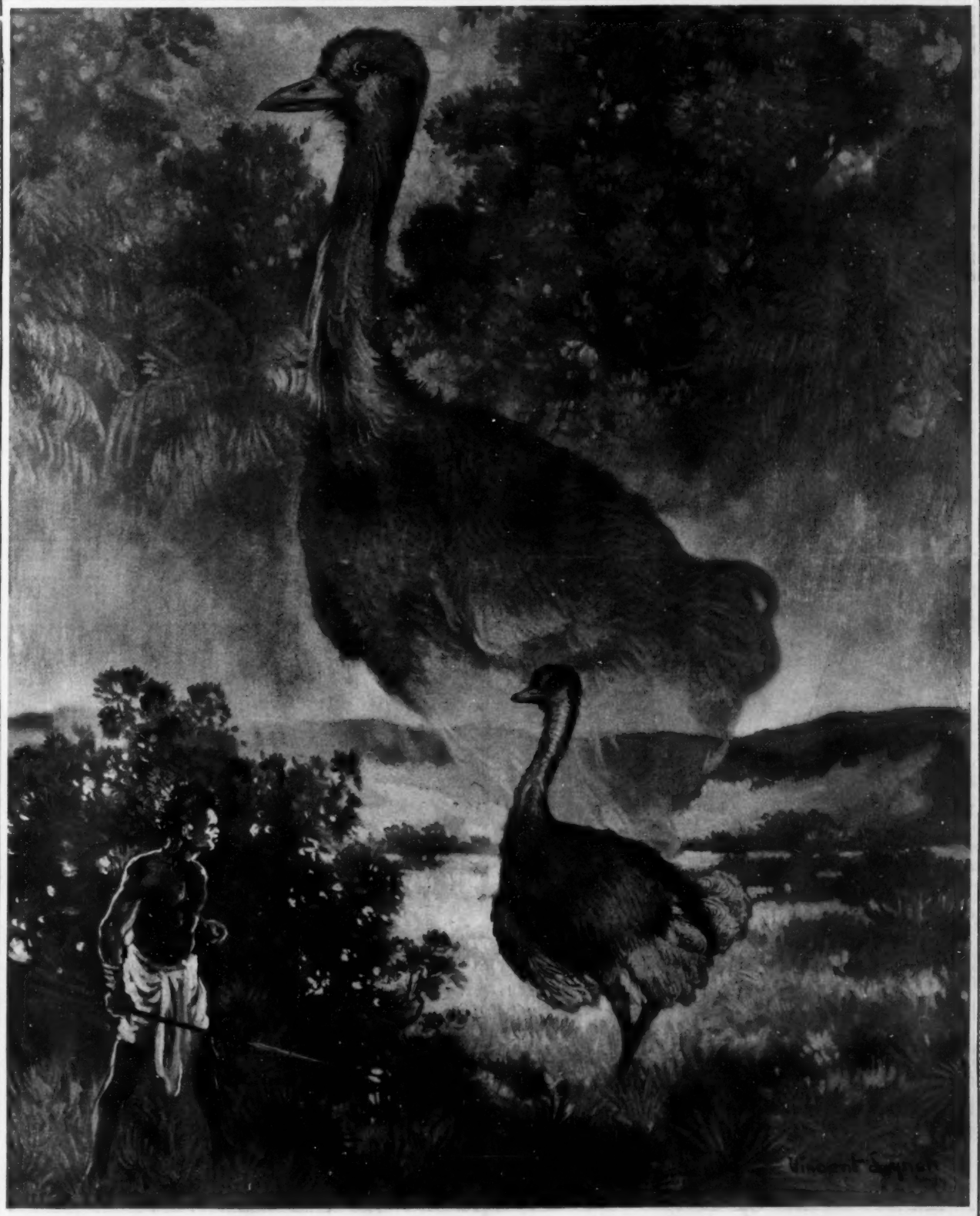
MAR 21

SCIENTIFIC AMERICAN



THE BIGGEST BIRD THAT EVER LIVED

The Problem of Our Navy—IV. The Cost of Unpreparedness

Vol. CX. No. 12
March 21, 1914

Munn & Co., Inc., Publishers
New York, N. Y.

Price 10 Cents
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The Long Journey of Science in Search of Perfect Light

Talks about MAZDA No. 3

"Not the name of a thing but the mark of a Service"

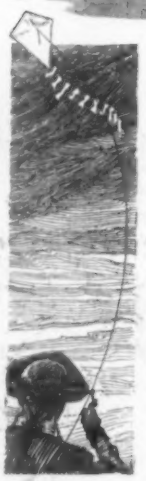
"Call me the link boy to light my way." Old Play.

The MAZDA Lamp of today which gives three times as much light as carbon lamps. It embodies the results of MAZDA Service to the manufacturers.

TURN the button—flash! Many lifetimes' study of electricity is summed up for you in that quick and splendid radiance.

Your forefathers had more trouble in getting the light of a single, dim candle. Yet we take this modern miracle for granted—this cheerful light summoned by the fingers, that is so many times more helpful, so many times cheaper per candle power than the cheapest candles.

Think of the ancient men conjuring the flame from the sapling, the pine knot, the grease from animal bodies, the oil of the earth. Think of the world's long struggle for more light and cheaper light, unguided in earlier days by an adequate knowledge or by any systematic method of reaching the goal that was sought.



Franklin's early experiment in harnessing electricity.

Think of the joy of the Dutch burgomaster von Guericke, more than two centuries ago, when he proved to scientists of his time that electricity had the power to give forth light. Think of these isolated experimenters turning cranks to light-flashes by friction, and of their endless groping to capture that light.

Von Guericke's electrical machine for producing electricity by friction.

Think of Franklin (one hundred and sixty years ago this past summer) flushed with excitement on discovering that the electricity of the sky could be conducted by a kite string.

Think of the tremendous obstacles overcome in the production of Edison's first carbon incandescent lamp. Electrical science was now to settle itself to the systematic study of this vast problem which in earlier days had been left to slow, blind, accidental advance. And manufacture had begun to feel the impetus of help communicated by organized research, experiment and selection.

Think of that next big step—this time the use of filaments of *metal*, such as tantalum and tungsten.

But obstacles were still to be overcome. For example, the tungsten paste filament was fragile. The first MAZDA lamp gave more light and cheaper light, yet left something still to be added—greater sturdiness fully to meet the strain of every-day-usage.

Then the triumph of the *drawn wire* filament in the MAZDA Lamp of today—*three times as much light* as the old style carbon lamps, with the same amount of electric current and rugged enough in elements and construction to round out the full wonder of its practical efficiency.

The plodding scientists had climbed a step higher in the great world-journey between the humble candle and the ideal light.

Will they stop here?

Will that group of scientists in the Research Laboratories of the General Electric Company at Schenectady be satisfied with these selected methods of construction revealed by the lamp marked MAZDA? The mark MAZDA itself answers that question.

MAZDA is the mark of a Service and it designates the great plan by which the MAZDA lamp *shall continue to mean* the highest achievement in incandescent lighting. MAZDA service means that the Research Laboratories are not only assembling the results of their own incessant and exhaustive investigations, and those of their associates in the active developing and manufacturing centers at Cleveland and Harrison, but are keeping in close touch with great experimental lamp laboratories in Europe.

MAZDA Service means also the furnishing to the General Electric Company factories, and to the factories of other Companies entitled to receive this Service,

Even the shape of glass bulbs is a subject for constant experimentation.

every new fragment of knowledge, from whatever source derived, which shall be selected in the course of this service to the manufacturers for embodiment in the MAZDA lamp.

In other words, the mark MAZDA on a lamp means that this world-wide MAZDA Service has been received by the makers of that lamp.

This is your assurance when you buy a MAZDA lamp — whether you buy it today, tomorrow, next month or at any future time—that you have the incandescent electric lamp that sums up the latest efforts of the broadest lamp service in the world.

GENERAL ELECTRIC COMPANY

In one of the testing rooms of the Research Laboratories. MAZDA Service involves unceasing tests and experiments with the aim that MAZDA shall always mean the furthest advance in metal filament lighting. 4604

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SEVENTIETH YEAR

SCIENTIFIC AMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CX] NUMBER 12.] NEW YORK, MARCH 21, 1914 [PRICE 10 CENTS $3.00 A YEAR

Fig. 1.—The conveyor bridge erected and in service.

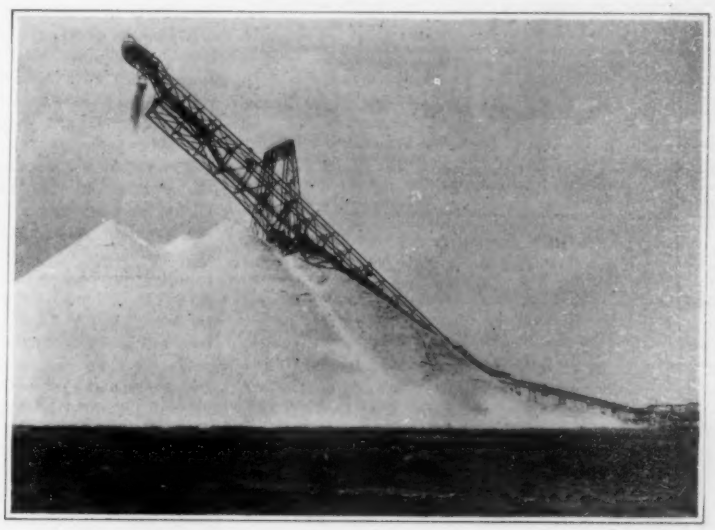

Fig. 2.—The dump growing rapidly under the conveyor.

Dumping Conveyor at the Brakpan Gold Mines

REMARKABLE as the highest, and perhaps the boldest construction of its kind in South Africa, is the sand conveyor at the Brakpan Mines of Johannesburg.

The refuse sand is drawn off from the cyanide tanks and shoveled into ropeway cars. These run down on an incline to the loading points, where they are stopped, and then proceed downward from the sand-treatment plant. At the extremity of this they pass out upon an inclined bridge, where they are clipped by means of a coupling apparatus to a traction rope in continuous motion, which hauls them up the bridge. On reaching the upper return sheave of the inclined bridge the cars discharge their contents automatically and return to the other side. The capacity of the plant amounts to about 180 tons of sand per hour. The single support of the inclined bridge is 166 feet high, the length of the bridge as first laid reached 200 feet in height, the bridge weighing 60 tons, and the lowest point of discharge for the cars being located at a height of 200 feet above the ground level.

Toward the close of the year 1909 the managers of the mines had under consideration a project to obviate the difficulties entailed by the employment of native laborers, and to handle the enormous quantities of material for which it is the usual custom on the Rand to employ belt conveyors. Although belt conveyors are well suited for handling material in bulk, and the total absence of frosts in the Rand district does away with the danger of handling moist sand, which is always present in our own climate, they, nevertheless, form a somewhat doubtful conveying agent for the material in question, because the finely ground quartz sand penetrates into the numerous axles and bushes, thus entailing great expense for repairs. Although the gold mines frequently employ belt conveyors for their other works, the above reasons decided them not to adopt this method for the removal of sand. They considered that closed boxes were, without doubt, the most satisfactory means of handling material which is detrimental to the mechanical conveying agent, because it remains undisturbed without being scattered or forming dust. An absolutely automatic traffic is equally possible on a ropeway as on a belt conveyor, and the dump can be readily extended, because it is only necessary to add further sections to the inclined bridge. At the beginning of the year 1910 the idea took definite shape, and it was decided that six cyanide tanks should first be served by the plant, and an additional four tanks connected at a later date. The suspension rails under the tanks were arranged horizontally for convenience in loading the cars, while the approach and departure were arranged at an incline. At the end of May, 1910, the contract was placed.

From a constructive point of view the nature of the material offered difficulties, as it has two natural angles of repose, one of 32 per cent for dry material, and the other of 42 per cent for moist sand. The piling of the dumps by means of belt conveyors suffers greatly from these conditions because large quantities of steel structural work and open bridges are necessary to overcome these drawbacks. In the present instance it was, therefore, decided to erect only one lofty support, and to attach the inclined bridge to it, so that the dump could be gradually piled round the support, and under the inclined bridge, and in this way furnish ample support for the structural parts. This provided a basis for later extensions of the inclined bridge without providing supports, which is a characteristic of this type of bridge. The angle of repose of the bridge was selected at 32 per cent, that is, for dry sand, because the carloads spread over the surface would rapidly dry.

Definite data were available for the plant by July, 1910, whereby the daily capacity was assumed to be 1,000 tons, and the total length of the line 630 feet. When working out the drawings, however, the plant was again extended, so that eight cyanide tanks instead of six were to be served. The dispatch of the first mechanical parts was commenced at the beginning of August, and it was then that the first difficulties were met with. It was the intention of the mine management to have the steel work erected in South Africa, according to the drawings of the designers of this type of conveyor. When, however, the drawings arrived, and the contractor was able to appreciate the magnitude of the contract, he withdrew his tender, and negotiations lasted a month before a suitable firm could be found to undertake the erection of the steel work. The bridge was put together on the ground, as the native laborers could not do the erection work up in the air. The lowest cross-bars of the support were then loosened, and the slanting bridge drawn up with the aid of two 10-ton winches and pulley blocks. The lower girders were then again set in place as shown in Fig. 3, and the upper girders disengaged, in order to get the slanting bridge into its proper position. This work was completed within a few days, and the bridge completely erected, as shown in Fig. 1. The mechanical parts were speedily put on, and the conveyor was put into service at once.

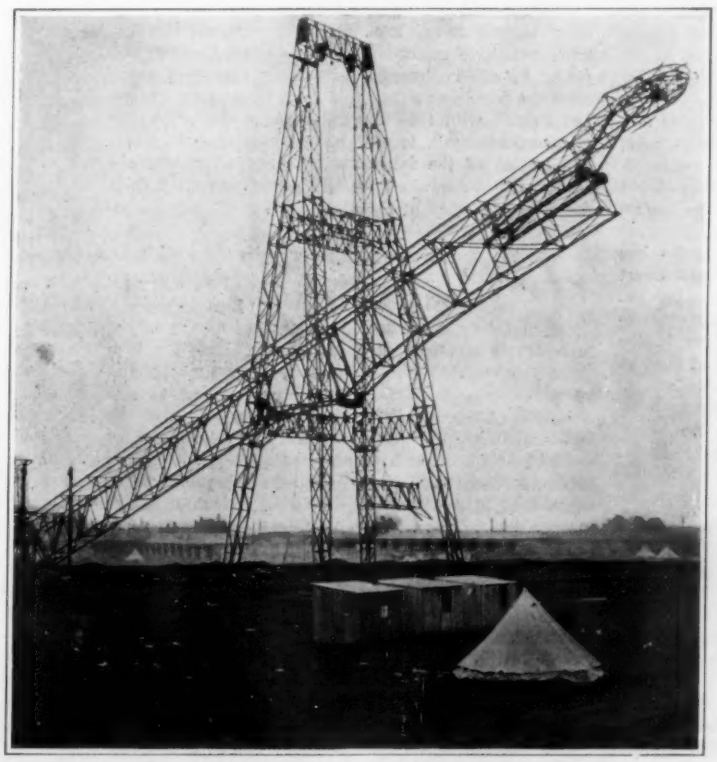

Fig. 3.—Replacing the lower girders after raising the inclined bridge past them.

As the dump gradually grew, the sand began to press against the supports, and it was, therefore, necessary (see Fig. 2) now and again, to move the detent for tipping the cars on the slanting bridge, so that dumping could be effected evenly round the supports. The first extension of the bridge was ordered in January, 1913, as the dump had already reached a height of 200 feet at this point.

The wire ropeway cars are equipped with an automatic coupling apparatus, which is actuated by the dead weight of the car. It gives an absolutely safe and reliable clip to the rope on the heavy gradient of 32 degrees, besides offering the great advantage that it couples traction ropes of varying diameters with equal safety, so that no adjustment of the apparatus is necessary, even when in course of time the traction rope stretches somewhat, and its diameter becomes reduced. The ropeway runs with an average power consumption of 60 to 90 horse-power.

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Founded 1845

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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

The Kodak Film Decision

THE decision recently handed down by the United States Court of Appeals, and printed on another page of this issue, upholding the Goodwin patent for the well known and widely used photographic film, contains one of the severest judicial arraignments of our patent system ever penned. It ought to be read by every congressman, by every inventor, by every manufacturer who makes patented goods—read because the daily press, scenting here the story of David and Goliath in a new form, has conveyed the impression that a struggling but obstinate clergyman was hounded by a great corporation with the sensational result that he came off the victor. We fear that the public will lose sight of the fact that a corporation has its rights as well as a poor inventor, and that the Eastman Company was entirely justified in exhausting every legal effort to evade a patent which it considered invalid.

Not the fact that a poor clergyman ultimately succeeded in beating a wealthy corporation (but with very powerful support, be it mentioned in passing) is to be taken to heart, but the shocking conditions which have rendered it possible to continue a dispute over the validity of a patent for a quarter of a century.

Eleven years and four months elapsed before the patent was finally granted. It had to run the full gamut of motions, counter-motions and appeals that make a patent interference a sore trial. And then, ten years and eight months elapsed after an infringement suit was brought before a United States District Court sustained five claims.

Apart from these delays, the history of the application in the Patent Office reflects no credit upon the officials. Five different examiners rejected the application during its eleven years' pendency in the Patent Office. No wonder the Court remarked: "Surely an extraordinary and deplorable condition of affairs!" No wonder, too, that the Court observes: "Most of the complications in the case would have been avoided had the Goodwin patent gone to issue in due course, as it should have done. The long delays and the contradictory rulings of the Patent Office would have discouraged an inventor who had not supreme faith in the justice of his cause."

The manner of conducting infringement suits has happily been vastly improved since the Supreme Court of the United States has laid down new rules. But the Patent Office cannot thus reform itself. Only congressional legislation can simplify the procedure in the Patent Office so that an inventor's vitality and finances may not be sapped by the interference incubus and so that a patent, which on its very face relates to novel subject matter, may be speedily granted. The SCIENTIFIC AMERICAN and other members of the technical press have for years insisted upon a more adequate protection of intellectual property. Latterly the magazines and the newspapers have taken up the fight. Perhaps this increasing hue and cry may at last be heard by our legislators.

The Washington-Paris Longitude Campaign

TO obtain the difference of longitude between two places on the earth's surface it is necessary to obtain their local times by star observations, and to effect an exchange of signals by means of which these times may be compared. The difference of the local times, at the epoch of comparison, is the required longitude difference. Among the many applications of wireless telegraphy to scientific purposes, the providing of a means for furnishing such signals in longitude operations is not the least. Particularly is this of value to geographers and explorers of unknown lands, and in other regions where the ordinary telegraph wire has not yet penetrated. During the past decade longitude determinations with the aid of radio signals have been effected in various parts of Europe, in Japan, and by the American Navy.

Transatlantic longitudes have hitherto depended on signals communicated over the cable; but experiments last spring having demonstrated the feasibility and advantages of wireless telegraphy, preparations were begun and plans laid for a determination of the longitude difference between Washington and Paris. This longitude campaign, at length opened in October, is now drawing to a close. Engaged in the operations are both Americans and Frenchmen, working separately and independently, each in co-operation with fellow countrymen on the other side of the ocean. There are thus four parties, two at Washington and two at Paris, each composed of astronomers and wireless experts, the former to make stellar observations, the latter to detect and note the radio signals. Synchronized by the standard clocks of the respective observatories, these signals are sent out, on the American side, from the powerful naval wireless station at Arlington, Virginia; and on the French, from the Eiffel Tower, Paris. Detected both by ear and by a sensitive photographic apparatus invented by the French, they are made use of not only for longitude, but also, through a knowledge of the distance separating Paris from Washington, for calculating the speed of propagation of the Hertzian waves. It may be added that similar experiments in other longitude campaigns have demonstrated this speed to be substantially that of light.

The longitude instruments employed are of the highest type known to astronomers, designed especially to eliminate, as far as possible, instrumental and personal systematic error. To guard against the possibility, nevertheless, of small residual personal equation influencing the results, the parties at Washington and at Paris exchanged places about the beginning of the year, carrying their instruments with them. At the time of this interruption, after a period of some three months, but six or seven favorable nights' work had been obtained. As a favorable night calls for clear observing weather both at Paris and at Washington, as well as conditions of the ether such as will permit satisfactory transmission of wireless waves across the ocean, it will be readily understood why it was planned to extend the campaign over a period as long as five or six months.

One advantage of radio over other methods of signal transmission is that anyone, with small receiving apparatus fitted up at slight expense, can detect the signals. The opportunity has accordingly been seized by a number of observatories on this side of the Atlantic to receive and record these signals, and in conjunction with astronomic observations, to obtain simultaneously their longitude differences from Washington. Longitude operations of a higher order of precision will doubtless, in time, be extended across the continent, and ultimately around the world. Frequent redeterminations are also proposed for the purpose of discovering possible creepings of the earth's crust.

The longitudes determined in the last century by cable differed from those previously obtained through more primitive methods by a second and a half of time. It will be interesting to learn how they agree with the wireless results, and how concordant will be the French with the American values. Longitude by wireless, after all, is still in the experimental stage. Publication of the methods employed and results obtained will be awaited by men of science with deep interest.

An Unsinkable Ship

THE term "unsinkable" as applied to ocean-going ships is strictly relative; and as so used, it means a ship which is unsinkable by any of the conceivable accidents of the sea which might overtake her. Such a ship would act as her own lifeboat, and were it not for the risk of fire, might dispense with the long lines of boats which crowd the top deck of the modern liner. The accident which sank the "Titanic" was of such a severe and unprecedented character that its recurrence, in the exact manner and with the same extent of injury, though conceivably possible, is certainly not likely. Nevertheless, since such an accident did happen, common prudence demands that the modern liner, to which is intrusted the lives of some five thousand people, shall be so constructed internally as to be proof against even such a terrific injury as that which sank the "Titanic."

At the time of that disaster, we were unsparing in our criticism of the construction of the ship, and therefore it gives us great pleasure to note that in their latest vessel, the "Britannic," recently launched, the White Star Company has so greatly improved the safety elements in the way of bulkheads and inner skins and watertight decks, that the ship could undoubtedly pass through such a severe ordeal as happened to the "Titanic" and yet remain afloat. Furthermore it is to the credit of the company that they have considerably exceeded the provisions for safety embodied in the report of the International Conference on Safety at Sea which sat in London last winter.

The "Britannic," which is 900 feet in length and of over 53,000 tons displacement at low draught, is provided with a double bottom over five feet deep, which is increased to over six feet throughout the machinery space. This bottom is divided by the transverse frames and by longitudinals into a vast number of watertight cellular compartments. Furthermore, we are pleased to note that the suggestion which the SCIENTIFIC AMERICAN made at the time has been followed in carrying the inner floor of the double bottom up the sides of the vessel to a height of several feet above the load-water line, thus providing throughout the boiler and engine room spaces a complete inner skin. The space between the outer and inner skin is thoroughly subdivided by the ship's frames and by a series of longitudinal girders.

Equally important as a safeguard is the fact that the main transverse bulkheads have been carried up, all of them at least one deck higher, and many of them two or three decks higher than they were in the "Titanic." There are sixteen of these bulkheads, five of which extend to a height of over forty feet above the deepest load line, while all the others are carried to a height of over 21 feet above the water line. Particular attention has been given to the design of these bulkheads, which have been specially stiffened to withstand the maximum water pressure that can come upon them, due to the deepest possible submersion of the ship in case of injury. Forward and aft of the boiler and machinery spaces, watertight steel decks, or "flats" as they are called, have been worked in at or below the water line; and this means that in the event of such a rupture of the skin as happened in the "Titanic," the water would be confined below these decks.

Another special safety provision is found in the unusual power of the Marconi apparatus on the "Britannic," which will have a transmitting radius of about 2,000 miles. An emergency power station has been built on a deck far above the water line to supply current for various purposes in case of accident to the main power station.

Excellent also and very original is the means provided for launching the lifeboats of which the ship carries forty-eight, two of which are fitted with powerful motors. The lifeboats are in four separate groups handled by a new type of davit which is practically a pair of powerful shear legs. These are so long that they will swing inward to the center of the ship, and outward so far that the boats may be lowered safely at any possible angle of heel of the ship.

George Westinghouse

THOSE who were privileged to know the late George Westinghouse will always remember that the thought of the vast benefits his inventions were conferring upon mankind was to him at all times a source of deep satisfaction. To mention Westinghouse is to think of the airbrake, which may safely be described as the greatest of all contributions to the safety of railroad travel. It was characteristic of the man that, great as was the early success of the airbrake, Westinghouse was ever industriously applying himself to its improvement; only recently we recorded a development of this brake as important, perhaps, as any produced since its inception. Equal in importance to his work on the airbrake was his influence in introducing and developing the alternating current system for electric light and power. With the patience, energy, and indomitable courage which marked the man, he purchased the original patents, developed them, introduced the system and made it thoroughly practical in this country. Safety in railroading is indebted to him also for the pneumatic-electric system of automatic signaling. Broad-minded and keen in his outlook, he was quick to recognize and purchase foreign patents of value and introduce them into this country, as witness the Parsons steam turbine and its widespread commercial development under his hand. His latest and most notable work was the invention and development of a practical, mechanical reduction-gear, for transmitting large powers, which is to be used in two new battleships and a repair ship of the United States Navy. Mr. Westinghouse's death occurred March 12th, in this city, in his sixty-eighth year. He won many distinguished honors abroad, receiving the Legion of Honor from France, the Order of the Iron Crown from Italy, and a decoration from King Leopold. He was awarded also the John Fritz Medal, bestowed by the leading engineering societies of the United States. The Royal Technical High School of Berlin gave him the degree of doctor of engineering. As showing the wide range of his activities, it may be mentioned that there are now between thirty-five and forty Westinghouse companies in Europe and America, capitalized at $200,000,000, and employing about fifty thousand persons.

Electricity

Longest Submarine Telephone Cable.—The telephone cable which is to connect Aldeburgh, England, with Walcheren, Netherlands, is to be 79 nautical miles in length, making it the longest submarine telephone cable in the world. It will furnish telephone communication between London and Berlin. The cable is to be of the four-core Pupin loaded type.

Linking Germany With Her Colonies.—The German government is negotiating with Holland to obtain permission to erect a wireless station on the island of Sumatra (Dutch West Indies). Such a station would, on the one side, be able to communicate with German East Africa, and, on the other, with the Caroline Islands. If this plan succeeds, all the German colonies would be able to communicate with Berlin without being obliged to make use of any cable. This would alleviate one of Germany's greatest grievances—that in communication with its colonies it is now so dependent upon Great Britain, which controls most cables.

Recent Telephone Statistics.—According to a preliminary report given out by the Director of the United States Bureau of the Census, 20,248,326 miles of telephone line were in use in the United States during the year 1912. This represented an increase of 313.2 per cent during the decade. In 1912 the Bell system controlled 74.7 per cent of the wires and 58.3 per cent of the telephones. The estimated number of messages or talks for the year was 13,735,658,245. This figure does not include messages for the 1,402,840 telephones of small companies which had an income of less than $5,000 during the year. The messages reported by the Bell system include only completed calls, while those reported by other companies may include some "line busy" or "do not answer" calls.

Death of John Gott.—Mr. John Gott, a pioneer of submarine telegraphy, died at Brighton, England, on March 8th, at the age of 75. He entered the telegraph service in 1852. From 1855 to 1864 he assisted in cable laying in the Mediterranean and the following year he was one of the crew of the "Great Eastern" on her first attempt to lay a transatlantic cable. He became the superintendent of the French Atlantic Cable Company's station at St. Pierre, Miquelon, in 1869, and has been chief electrician of the Commercial Cable Company since its inception. However, his greatest achievement came in the last year of his life when he developed a system of cable telegraphy, employing a Morse sender and receiver, thus doing away with the syphon recorder and making it possible to relay the messages from and to land lines. Nine months ago a message was sent through from San Francisco to London without retransmission. A description of the system was published in the SCIENTIFIC AMERICAN of November 22nd, 1913.

New Electric Locomotive.—Among recent European electric locomotives we may mention the one built for the Rhätische railroad system. It is being used on the St. Moritz-Schuls line which has a branch from Samaden to Pontresina. The line is narrow gage and is supplied by single-phase current at 10,000 volts and 16 2/3 frequency, the locomotive being required to draw a train of 20 tons maximum. The locomotive carries two electric motors of 350 horse-power each. A single countershaft takes the power from both the motors by gearing, and this shaft serves to run all four driving wheels on a side. Between the third and fourth locomotive axle is mounted a false axle which receives power from the countershaft by means of a crank, and this axle serves to operate the four locomotive axles. The present locomotive runs very well in actual service, and during the first three months it is stated to have covered 8,500 miles. Current comes from an overhead trolley wire by two pantagraph trolleys, the locomotive being of the square or box-built type.

New Telephone for the Deaf.—One of the newest telephone devices for the use of the deaf is the German "phonophor," consisting of a telephone transmitter worn on the person or placed upon a table, and a small telephone held to the ear. The most novel form of the device is the one intended to give a great reinforcement to the sound by the use of powerful telephones, and here it is made up for ladies' use in the shape of a small leather handbag of familiar shape. Lifting up a flap uncovers a pair of microphone transmitters, and the bag is simply placed on a table, a store counter or the like, while a small hand telephone is held to the ear, or the latter device can be used as a head clamp by a little adjustment. The bottom of the bag is flat so as to stand upright, and it can not only contain the battery and the ear device, but also leaves room for other objects. Sounds are made still louder by a more powerful type intended for men's use, and it has the appearance of a kodak box with four microphones inside, whose openings are flush with the surface and covered with perforated plates. The box is placed on the table and a light headpiece holds a telephone to the ear.

Science

Standard Time in German East Africa.—Uniform time of the meridian 37 deg. 30 min. east was officially adopted in German East Africa on October 1st, 1913.

An International Congress of Ethnology and Ethnography will meet at Neuchatel, Switzerland, June 1st to 5th, 1914.

An Important Event in Asian Geography was the recent linking up of the survey of India with the Russian triangulation in the Pamirs, a task which has involved five years of labor. Some of the British stations were at altitudes ranging from 18,000 to 19,000 feet above sea-level.

Sir Isaac Newton's House, No. 35 St. Martin's Street, Leicester Square, London, is about to be pulled down, as it is in so ruinous a condition that any attempt to preserve it would be hopeless. This house is not only historic on account of the great philosopher's residence here from 1720 to 1725, but also as the home subsequently of Dr. Burney, the composer, and his daughter Fanny, who wrote her first novel, "Evelina," here.

The Katmai Dust Cloud, which caused a general haziness of the atmosphere over much of the northern hemisphere, reaching a marked maximum in August, 1912, appears to have now practically disappeared. As pointed out by Prof. Kimball, the duration of this cloud was somewhat less than that due to the eruptions of 1902-03, which lasted two years, and markedly less than that of the dust ejected by the great Krakatoa eruption of 1883.

Explorers Killed by Cannibals.—It is reported that a forester named Deininger, who was attached to the Woods and Forests Service of German East Africa, but had been sent to New Guinea to help organize the forest service there, has been murdered by cannibals in the island of New Mecklenburg, where he was collecting specimens of valuable woods. Another German scientist and fourteen native companions are said to have shared his fate.

A New Volcanic Island has appeared in the Bonin group, three miles east by south of Iwojima Island. It is five miles in circumference and attains a height of 1,000 feet. The appearance of this island is especially interesting for the reason that the other Bonin Islands, although of volcanic origin, are believed to date back to Eocene times. They contain no hot springs, and are not subject to earthquakes.

New Atmospheric Gases.—In a paper read before the British Association meeting at Birmingham, F. W. Aston reported investigations which indicate that neon, one of the rare gases of the atmosphere, is really a mixture of two gases, which are identical in all their properties except atomic weight. That of the heavier is 22.1, and of the lighter 19.9. Ordinary neon appears to contain about 12.5 per cent of the heavier gas. The spectra of the two gases appear to be identical.

Yet Another Antarctic Expedition is in prospect, according to plans briefly outlined in *Petermanns Mitteilungen.* This will consist of an attempt to trace the entire outline of the Antarctic coast, and will be undertaken by Commander Evans, who succeeded Scott in command of the last British expedition. His plan is to circumnavigate the continent, keeping as close to the shore as the ice will permit, and making numerous landings. The geographical importance of such an undertaking equals or exceeds that of Shackleton's proposed trans-Antarctic journey.

World-shaking Volcanic Earthquakes.—One of the most interesting facts in connection with the recent eruption of Sakurajima, in Japan, is that earthquake shocks were strongly registered in Europe at the time of the shocks which attended the eruption, and caused so much damage in the neighboring city of Kagoshima. According to C. Davison, who discusses the subject in *Nature*, this is the first time that a volcanic earthquake has been recorded across an entire continent since the horizontal pendulum was adapted for seismographic purposes. Volcanic earthquakes as a rule are decidedly local, indicating that the seat of the disturbance is at a very moderate depth in the earth.

Periodical Medical Examinations for Everybody, as a means of detecting and checking disease in its earliest stages, were earnestly advocated by Dr. Victor C. Vaughan in an address on the subject of preventive medicine before the seventh annual meeting of the Association of Presidents of Life Insurance Companies. Looking into the future, the speaker told of the time when "everybody goes to a physician twice a year and undergoes a thorough examination. The result of this examination is stated in a permanent record, and no two consecutive examinations are made by the same physician, in order that a condition overlooked by one may be detected by another. Cases of doubt, or in which there is difference of opinion, are referred to special boards." Dr Vaughan indorsed the proposal that the insurance companies offer their policy holders free medical re-examination at stated intervals; a plan that would probably benefit the companies financially through the increased longevity of the insured.

Inventions

Typewriter Eraser Operated by a Key.—In patent No. 1,083,466 Harry I. Seddon of Portland, Ore., provides an erasing means for a typewriter in which an erasing head is yieldingly pivoted on a bar and the latter is connected to a key lever so that the key lever may be moved to operate the eraser.

Uniformly Curved Trifocal Lens.—Henry Bolde of New York, assignor to the Meyrowitz Manufacturing Company, has patented a trifocal lens in which two minor lenses are seated respectively in the two faces of a major lens, both of the faces of the completed lens being of uniform curvature throughout.

Rimless and Removable Eye-glass Lenses.—Rimless eye-glasses, in which the lenses are detachably mounted in a wire holder, are shown in patent No. 1,084,262 to Robert James Fleming and Thomas Alfred Robinson of London, England. It is claimed that the lenses are securely held and may be easily fitted and removed by the wearer.

A Hollow Metallic Propeller.—Pierre Jacomy, Asnieres, France, in patent No. 1,082,750 presents a light hollow metallic propeller which is made of a single piece of metal in the form of a weldless tube with its edges or ends of a decreasing cross section and the ends formed into helical blades, openings at the center receiving a sleeve.

A Novel Nozzle for Cotton Pickers.—Emil Gathmann of Baltimore, Md., has provided a nozzle for pneumatically operating cotton pickers which flares outwardly funnel shape and has on its inner side a spiral-toothed rib with a plurality of connected convolutions designed to engage the cotton, dislodge from the boll and direct it inward into the machine.

An Improved Moving Picture Screen.—A patent No. 1,082,123 was issued to Samuel H. Jones, of Altus, Okla., for a process of producing a moving picture screen in which an oil-cloth base is subjected to a softening oil after which a coating of jap-a-lac and turpentine and after that has partially dried a metallic powder is rubbed in until a velvety sheen is produced. It is claimed that the pictures thrown on such screen will be more distinctly shown and brought out more in detail and that the screen can be used in daytime.

A Process of Canning Asparagus.—Patent No. 1,083,311 to George W. Weber of St. Paul, Minn., assignor to American Can Company, of New York, presents a process of canning asparagus and other food products in which the asparagus or the like is placed in a sheet-metal container and the container is subsequently reduced or compressed midway between its ends to grip and hold the food product and prevent it from movement within the container, thus preventing any breaking up that might result from its moving about in the can.

Automatic Lock Release for Express Safes.—In patent No. 1,083,401 John Holeck and David Schwartz of Milwaukee, Wis., provide an express safe for cars in which there is an inner stationary receptacle, a stationary outer casing and an interposed rotary shell which is driven from an axle of a railway car and lock mechanism for the doors of the shell and casings are provided. The lock mechanism is entirely within the safe and prior to closing the safe the operator sets the pointer to correspond to the number of miles to the next station or point determined upon where the automatic unlocking takes place.

A Crown Seal Closure that Will "Pop."—In patent No. 1,082,696 to Arthur W. Hicks, administrator of John Augustus, deceased, is shown a bottle closure having a metal cap secured over the mouth of the bottle and a lining in the cap which has an impervious adhesive face which adheres hermetically to the bottle mouth while the lining is unattached to the cap so that in removing the cap from the bottle the top is separate from the lining and the lining will be blown from the bottle mouth with an explosive sound by the pressure of gas in the bottle.

Rescuing From Submarine Boats in European Navies.—The subject of saving lives of men on submarine boats, the mechanism of which has been deranged, has been attracting considerable interest throughout the world recently. The importance of this subject was brought out by a recent disaster in the British Navy. Several European navies have installed apparatus on their submarine boats for renewing oxygen and absorbing the products of respiration from the men on the boat for a period of seventy-two hours, during which time it is usually possible to effect a rescue which otherwise would be prevented by the men suffocating. Another popular method is to locate in the boat a number of little machines designed to shut off the respiratory organs of the wearer from the water, and permit him to breathe fresh air supplied by a special device until he can rise to the surface of the water, after which the device may be thrown away, the balance of the apparatus serving as an ordinary life preserver until rescue can be effected. These little machines have also been used for rescue work at bathing beaches very successfully.

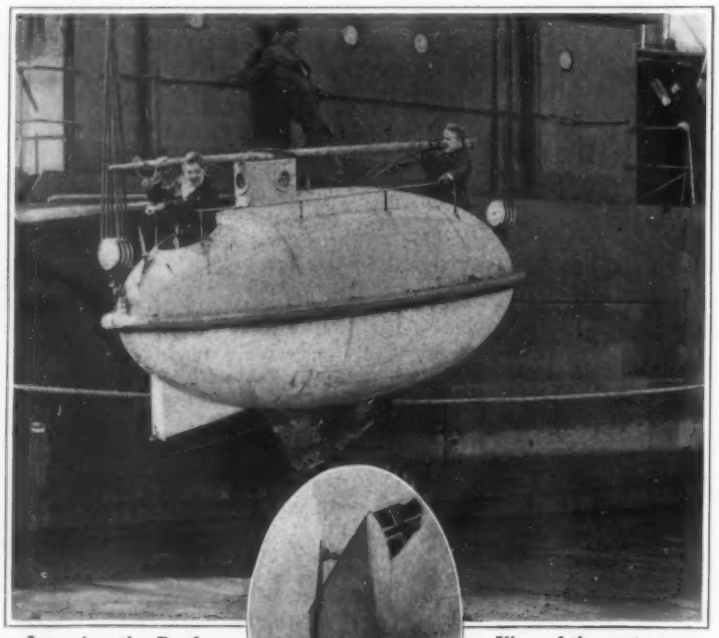
A Real Lifeboat

By Robert G. Skerrett

THEORETICALLY, at least, a lifeboat is deserving of that name when it mensures up to the requirements imposed by the exigencies of the service for which it is designed. As a broad proposition, lifeboats upon seagoing craft are provided in order that the passengers and crew may leave a stricken vessel, or that they may be put overboard from a succoring craft for the purpose of rescuing others in distress. To do this, the lifeboat should be of such an order that it could be gotten into the water with haste and not impose too much skilful handling to accomplish this effectively. Next, when afloat, it should be capable of carrying and protecting the while those within it. The boat should be so constructed that it would live in a stormy sea, and while making harbor or awaiting the coming of aid, be able to keep alive those that it has taken from the abandoned ship. How far does the average lifeboat live up in fact to this theoretical standard?

Thirty-one men—all hardened and experienced seamen—tried to get away from the oil-tanker "Oklahoma" during a recent frigid storm. One boat capsized after hitting the water, and six out of the eleven in her were drowned. The five others were rescued through the courage of a boat's crew from another craft. The second boat got away with twenty aboard, but seventeen of these had disappeared when relief came. Two of the three remaining were dead, and the other died without regaining consciousness. All perished of exposure.

On some sixty vessels flying the flags of Norway and the United States, there is installed a type of lifeboat which uniquely meets the ideal requirements. The boat is the invention of Capt. Ole Brude, an experienced mariner. The Brude boat is built of steel with a deep double bottom in which can be carried both drinking water and water ballast; it is equipped with a lowering centerboard to facilitate sailing; and is globular in shape by which it is possible to protect the passengers from the sea and the weather. Because of its form, method of construction, and heavy wooden guard, the boat is exceptionally strong. It is non-capsizable; virtually non-sinkable; and, with persons inside, has been dropped without harm from a height of nearly forty feet. When the two circular hatches are closed, the boat, *pro tem*, is as snug as a submarine. A boat of this type is in fact a lifeboat and liferaft combined, and has an inside seating capacity for thirty persons, but can carry and support forty-five more outside. A boat of this type crossed the Atlantic in mid-winter a few years ago under sail, and weathered several severe gales on the journey. The four men aboard of her suffered no inconvenience despite the bitter weather. It was the successful conclusion of this convincing practical test that gave the Brude boat its first recognition. This is the character of lifeboat that should be generally provided for all ocean-going steamers, as it is a lifeboat in the fuliest sense of the term.



Lowering the Brude steel lifeboat.

View of the centerboard.

The insert picture showing the lifeboat on the open sea on the way from Norway to America.

The Brude boat undergoing test by the United States inspectors.

The Homing Instinct in Crabs is illustrated in some cases recently reported from England. Several crabs from Yorkshire, liberated at Skegness, in Lincolnshire, walked home again. A most remarkable case was that of a pair of crabs, male and female, which were taken in the same trap off the Yorkshire coast. They were carried to Lincolnshire, marked, and returned to the sea at different places along the coast. In the course of time the same pair, having found each other in the sea, were captured together a second time in a trap at their original home in Yorkshire.

Cinematographs of the Aurora, taken by Carl Störmer at Bossekop, Lapland, are reproduced in a recent number of the *Comptes rendus*. Most of his attempts to obtain such pictures were unsuccessful, on account of the feeble luminosity of the phenomenon, but on three occasions, during particularly bright auroras, he secured excellent results. Each image was given an exposure of from one half to one second.

Enlarging and Reducing Phonograph Records

By R. Arapu

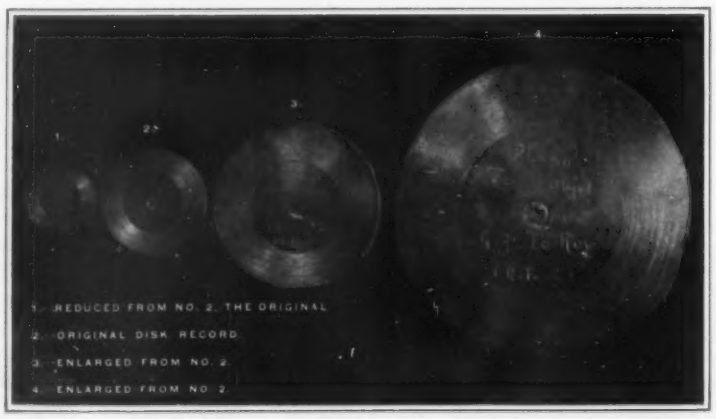
THE ingenious method of enlarging and reducing phonograph records, which is here described, was invented by M. Georges LeRoy, director of the chemical laboratories of the city of Rouen.

Phonograph records, i. e., the traces made on wax disks or cylinders by the needle of a recording phonograph, can be enlarged or reduced by the following physico-chemical process, without the aid of the pantograph, by which such reproductions have hitherto been made exclusively. In the first place it should be observed that the new process is superior to the pantographic method because it excludes the employment of levers and other mechanical organs, which inevitably affect the record by means of their own vibrations and reactions. On the other hand, the record may be improved by employing the new process. In current practice, the primary wax record is made by means of sounds of exaggerated loudness in order to produce a strong impression, and injurious secondary vibrations are thus evoked and recorded. By the new process a record made with tones of moderate intensity, free from disturbing secondary vibrations, can be enlarged until it produces tones as loud as may be desired. Conversely, a record made with loud tones can be reduced, and thereby softened, in addition to being compressed into smaller compass.

Principle of the Process.—The enlargement is effected by the dilatation of molds of the primary record, made of material which is greatly dilated by prolonged immersion in appropriate solutions; for example, gelatine immersed in aqueous solutions, or vulcanized rubber immersed in carbon disulphide. Conversely, the reduction is effected by the contraction produced in similar molds by appropriate treatment, as by the dessication of a mold composed of highly hydrated gelatine.

Technique of the Process.—From the primary wax record a copy is made in copper by galvanoplasty. For enlargement a mold of this copper record is made in a concentrated solution of gelatine, containing 30 to 50 per cent of dry gelatine. The gelatine mold is immersed in cold or tepid water, pure or containing substances that promote the expansion of the gelatine. When the mold has attained the desired size it is made insoluble by immersion in a solution of formol, and is then molded in wax or plaster. From the wax or plaster mold is made a galvanoplastic copper matrix, or master record, with which the working records are stamped. The diameter of the soft gelatine disk can be tripled by immersion, and the enlargement can be increased indefinitely by repeating the process on gelatine copies of the enlarged plaster or copper matrices.

For reduction the copper plate made from the primary wax record is used to produce a copy in weak gelatine, containing 10 to 25 per cent of dry gelatine, which is dehydrated by immersion in dilute alcohol, a solution of sodium sulphate or of Rochelle salt, by exposure to a current of dry air, or by the action of a vacuum desiccator. The gelatine record, thus contracted and reduced, is copied successively in wax or plaster and in copper, in the manner described above. The diameter of the gelatine disk can be contracted to 60 per cent of its original value, and the reduction can be continued indefinitely by contracting gelatine disks made from the reduced copper plates. In the accompanying photograph No. 2 represents an original record of 120 millimeters diameters, No. 1 a reduction to 80 millimeters, No. 3 an enlargement to 190 millimeters, and No. 4 a second enlargement to 340 millimeters.



How a talking machine record may be magnified or reduced in size.

1. Shows a reduction to 80 millimeters diameter. 2. The original record of 120 millimeters. 3. An enlargement to 190 millimeters. 4. A second enlargement to 340 millimeters.

Protective Spectacles for Glassworkers.—At a recent meeting of the Royal Society Sir William Crookes described some experiments on which he has been engaged to produce a kind of glass for use in spectacles which will cut off the extreme heat rays that are so injurious to the eyes of glassworkers in causing cataract, without obscuring too much light or materially affecting the color of objects seen through the glass. He sought also to cut off the ultra-violet rays. Although the ideal glass, which would transmit all the colors of the spectrum, but cut off the invisible rays at each end, has not yet been found, he has produced spectacles which transmit less than 10 per cent of the heat rays, and none of the ultra-violet, and are sufficiently free from color for practical use. He doubts whether absolute freedom from color is desirable. After experimenting with a great number of elements he found that combinations of two or more of the following were likely to come nearest to the desired result: Cerium, chromium, cobalt, copper, iron, lead, manganese, neodymium, nickel, praseodymium, and uranium.

The Rise in Prices and the Increased Cost of Living

Changes in Leading Manufacturing Countries of the World During the Period 1900-1912

By John B. C. Kershaw, Fellow of the Royal Statistical Society, London

THE industrial unrest, which is such a marked feature in all the civilized countries of the world at the present time, has been ascribed to many causes. In an article published in April, 1912, in the *Engineering Magazine* (New York), the present writer analyzed these causes in some detail, and stated his opinion that the increased cost of food, and the rising standard of comfort and luxury demanded by the workers, were the two primary and chief causes of this unrest, and of the general demand for higher wages.

In the present article it is intended to give facts and figures in support of this opinion, drawn chiefly from an important publication relating to the "Cost of Living of the Working-Classes," issued recently by the Statistical Department of the British Board of Trade (Cd. 6,955, 1913). This report, although dealing primarily with the conditions obtaining in Great Britain, covers the rise that has occurred in food prices in the leading manufacturing countries of the world. Other publications drawn upon are: No. 137 of the Annals of the American Academy of Political and Social Science, published in July, 1913 (this deals entirely with the minimum wage in its relation to the cost of living); an address by Prof. H. N. Dickson, and a paper by Prof. Fisher of Yale University, read and discussed at the British Association (Birmingham) meeting in September last. Publications of this kind, however eminent their authors, are not read by the general public. The purpose of this article is to render the valuable information contained in these reports, addresses and papers available for a much wider circle of readers, and to present certain of the data in more easily digested and attractive form.

The Increased Cost of Food.

On page 62 of the introductory summary of the Board of Trade Report on the cost of living, already referred to, there is a most valuable table showing by means of "index numbers" the changes in the level of food prices which have occurred in the United Kingdom and its colonies and in certain foreign countries in the years 1900–1912. In this comparison the year 1900 is used as a base year, and the retail or wholesale prices of food in each country are taken as represented by 100 in that year. Since comparative figures of this kind are much more illuminating when presented in graphic form, the author has constructed diagrams I. to IV. from the official data. The figures themselves, which represent a vast amount of time and trouble on the part of those responsible for their collection, are given for purposes of reference only in Table I.

Diagram I. gives the curve for the changes in food prices in the United Kingdom, Russia and the United States in the years 1900–1912. The rise is seen to have been practically continuous in all three countries, but whereas in 1911 the United Kingdom only showed an increase of 9 per cent, in Russia the increase had been 21 per cent, and in the United States the curve of prices had attained a level of 139, equivalent to an increase of 39 per cent on the prices of 1900. In Diagram II. the price curves for France, Holland and Germany are presented in a similar manner and on a similar scale. Here we see that between 1901 and 1906, France benefited by a decline in food prices, the index numbers for which dipped down to 95 (or 5 per cent below the standard), in the years 1902 and 1906. Since 1907, however, the rise in food prices in France has been very marked, and in 1912 they reached their maximum of 117, equivalent to a rise of 17 per cent on the 1900 standard. In Holland the rise has been steady and continuous, and the curve has approximated in form to that of the United Kingdom, ending in 1912 at a level of 123, as compared with 115 for the United Kingdom. Holland and the United Kingdom, it may be pointed out, are the two free trade countries of Europe, and therefore, if free trade means (as its supporters declare) cheap food, one would expect to find the rise in prices much less striking than in highly protected countries. Whether this expectation is justified by the curves shown in Diagrams I. to IV., the writer of this article will not attempt to decide, since it would lead him away from the real purpose of this section, which is to present facts. The German curve shows a slight dip in the years 1907–1908, when the price of food in Germany declined, but since the latter year the rise has been very marked, and the curve ends in 1911 at a level of 128, equivalent to a rise of 28 per cent on the 1900 standard.

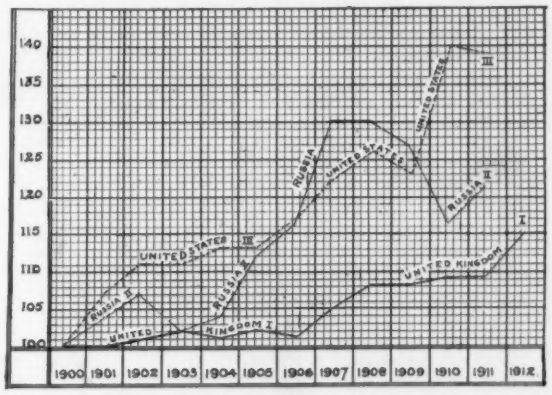


Fig. 1.—Diagram to show changes in the level of food prices in the United Kingdom, Russia, and the United States in the period 1900-1912.

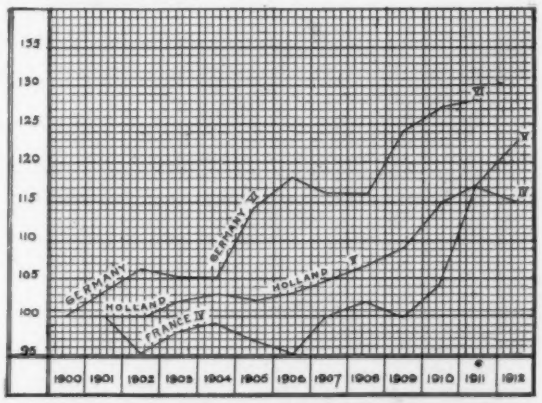


Fig. 2.—Diagram to show changes in the level of food prices in France, Holland, and Germany in the period 1900-1912.

Fig. 3.—Diagram to show changes in the level of food prices in Austria, Italy, and Norway in the period 1900-1912.

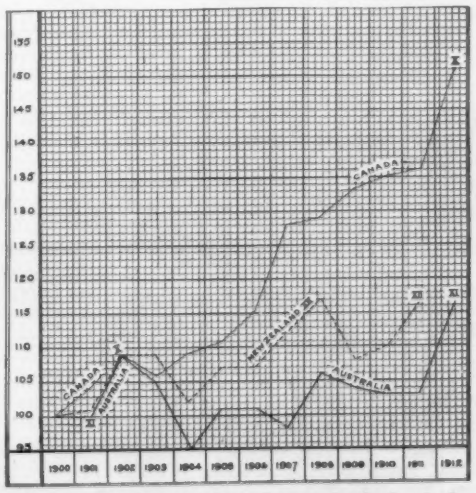


Fig. 4.—Diagram to show changes in the level of food prices in the three most important British colonies: Canada, Australia and New Zealand, during the period 1900-1912.

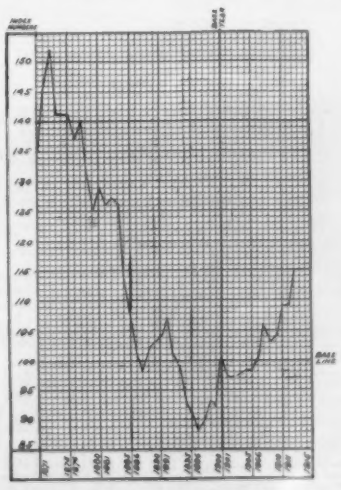


Fig. 5.—Diagram to show changes in the level of wholesale prices of forty-seven articles in the United Kingdom, 1871-1912.

Diagram III. shows the curves for Austria, Italy and Norway, and calls for little comment. Italy and Norway benefited by a decline in food prices in the years 1902–1906. Since the latter year the rise has been steady but not very large, the curves ending at the levels of 119 and 120 respectively. In Austria the rise in food prices has been more marked and continuous, the increase being equivalent to 35 per cent in the 12 years.

Diagram IV., which gives the curves for the three most important colonies of the United Kingdom—Australia, Canada and New Zealand—is extremely interesting, and deserves close study and attention. Each of these colonies produces and exports food to the mother country in large quantities, and one would expect to find that the rise in food prices in these food-producing countries was less marked than in the United Kingdom or in the other industrial countries of Europe. In one case only is this so, namely, Australia, for up to 1911, the price curve for this colony had only attained a level of 103, and for the whole period the average has been 103½. In New Zealand the course of prices has been more irregular, and the curve rises to 109 in the years 1902–1903, and attains its maximum of 117 in 1908. The course of prices in New Zealand has thus shown a greater average percentage increase than in the United Kingdom. The price curve for Canada is, however, the most remarkable, for in this country the increase in the cost of food has been more marked than in any of the industrial or manufacturing countries, and the curve has steadily ascended until it attained the extraordinary level of 151 in the year 1912, or a rise of 51 per cent as compared with 1900.

Placed in the order of their "dearness" as regards the cost of food (in 1911 or 1912) we thus have the following list of countries: Canada, 151; United States, 139; Japan, 138; Austria, 135; Belgium, 132; Germany, 130; Holland, 123; Russia, 121; Italy, 120; Norway, 119; New Zealand, 116; Australia, 116; United Kingdom, 115; France, 115. A study of the curves given in Diagrams I. to IV. and of the summary of their meaning given above indicates therefore that during the past six years there has been in all countries (agricultural as well as industrial) a very marked rise in the price of food, and also that so far as the figures are available, the increases in the years 1911, 1912, 1913 have been greater than in any previous year.

The Causes of the Increased Cost of Food.

The causes of the increased cost of food in all countries, that is so clearly indicated in Diagrams I. to IV., are not perfectly understood and the opinions of economists are sharply divided upon this question. There are many who believe that the continued growth of the population of the world, the increased demand for luxuries, and the extravagant way in which the present generation is exhausting the material resources of the earth, is beginning to have its effect upon prices. Food and the other commodities of life are dearer, in the opinion of this school of economists, because, in relation to the increasing numbers who want them, they are becoming more scarce.

This view finds expression in the presidential address of Prof. H. N. Dickson, before the members of the Geographical Section of the British Association, at Birmingham, England, in September last. In this address Prof. Dickson stated that "he had no desire to sound an unduly alarmist note, or to suggest that we are in imminent danger of starvation, but it would be well, even on the suspicion, to see if our information is adequate and reliable, and if our conclusions are correct; and not merely to drift in a manner which was justifiable enough in Saxon times, but which, at the rate things are going now, may land us unexpectedly in difficulties of appalling magnitude."

In support of this view, it must be noted that the population of the whole world is increasing by 20,000,000 persons annually, and that as water covers three quarters of the earth's surface, there is only one fourth available for the support of human life. The following quotation from a recent article by Mr. Chiozza Money, an English liberal political economist, emphasizes the teaching of Prof. Dickson's address, and will be read with especial interest in America:

"All mankind has for a basis no more than about 50,000,000 square miles of land, no small fraction of which is desert territory, or for other reasons uninhabitable. The parts of the world which are particularly favored in point of power supplies, whether of coal or mineral oil, or water, are few. The easily-worked mines of iron, copper, tin, lead, zinc, etc., have been already creamed, with results which have made themselves evident in price. As to timber, the world is using it much more quickly than it is growing it, and we have the extraordinary fact that the United States of America, which has some of the finest forests in the world, has hacked away at them so rapidly, that some sorts of wood are scarce in her vast territory."

The opposite view that food and other commodities are dear because gold has become more plentiful, finds its strongest advocate in Irving Fisher, Professor of Political Economy at Yale University. In an article upon "The Monetary Side of the Cost of Living Problem," contributed to volume 48 (July, 1913) of the *Annals* of the American Academy of Political and Social Science, and in a paper contributed to the Birmingham, England, meeting of the British Association, Prof. Fisher gives many reasons and arguments for believing that the present rise in prices is due to an inflation of money and credit, rather than to a scarcity of food and other commodities. His chief argument is based on the fact that the periods of high prices in the past have always coincided with some fresh discovery or more active exploitation of the gold resources of the world, and that periods of low prices have likewise coincided with a lull or setback in the production of the precious metals.

The following paragraph summarizes this argument:

"The rise in prices during the last fifteen years has not only been great, but general. It applies to almost all commodities and to all countries for which we have figures. If practically all the children in a certain school were stricken simultaneously with typhoid fever, we should reasonably suspect that there was some common source from which the germ had come. If the prices of most commodities rise somewhat simultaneously, we, very reasonably, it seems to me, should attribute this rise to a common factor, rather than to various isolated causes relating to the commodities separately considered. In other words, on the basis of probabilities, it is reasonable to assume that the present general rise in prices is related to some common fact. Since every price is tied to gold, and the supply of gold has increased during the last fifteen years, we would not then be unreasonable in suspecting, if not convicting, that fact of being responsible for the present high prices. No other important common cause has been suggested."

In his British Association paper, Prof. Fisher pleads for the appointment of an International Conference on the subject, a bill for which passed through the United States Senate last Spring, and states that this proposal has the support of the President and ex-President of the United States, and also of many high officials in the European capitals.

In the present writer's opinion, the increased prices of food and other necessaries of life may be, with some show of reason, attributed to a combination of the above two causes. The increased demand arising from the growing population of the world, and increase of luxury, have no doubt enormously stimulated the call for food and commodities of all kinds. At the same time, the increased output of gold and greater use of credit have tended to cheapen these, in their relation to commodities, and, therefore, one has to pay more in gold or silver to obtain the same amount of food than five or ten years ago. Which of these causes has had the most influence in bringing about the rise of the past five years, the writer will not attempt to decide.

Is the Rise in the Price of Food and Other Commodities Likely to Continue?

The question headlined is, of course, the practical one that all affected (either as buyers or sellers) by the recent rise in values, wish to have answered. The only figures that bear upon this question are those contained in the British Board of Trade Report already referred to, and they represent the course of wholesale prices of 47 articles of consumption in the United Kingdom from 1871 down to the present date—the year 1900 being employed as base year with a value of 100, and the values being expressed as before—as index numbers, in relation to that base. Diagram V. gives these values in the form of a curve, and the diagram certainly conveys little comfort to those who have been heavily handicapped by the rise in prices since the year 1900. Compared with the prices ruling in the United Kingdom from 1870 to 1880, present prices are low, and if history is to repeat itself, many years will elapse before the maximum point of the curve is attained, and the descent to a lower price level is commenced. Many things have changed however in the conduct of commerce and industry since the years that followed the Franco-German war, and it is quite possible that an analogy from the past, in this case, is an unsafe guide to the course of future events. That some high authorities believe that an era of high prices is before us, is proved however by the following extract from the British Association paper by Prof. Fisher:

"The outlook seems to many of us to indicate that the rise in world-prices is permanent, and is likely to be aggravated in future years. Under these circumstances, even though we cannot immediately apply remedies for lack of sufficient agreement, the sooner we can secure the necessary data to lead to such an agreement, the better."

Conclusions.

In view of the vast importance of the subject with which this article deals, there can be little doubt that Prof. Fisher's demand for the calling together of an International Congress to consider the problem is wise and timely, and will ultimately be adopted. As Prof. Fisher points out:

"The great conflict of opinion at the Conference will doubtless be as to whether the rise of prices means an inflation of money and credit or a scarcity of goods. If the result of its investigations should indicate that the rise of prices is chiefly a monetary phenomenon, this would indicate the importance of a monetary remedy, such as some plan for 'standardizing' monetary units, i. e., 'stabilizing' the general level of prices. But whether or not any such far-reaching remedy can be applied or even recommended, there are other and less ambitious remedies in the way of saving waste which ought to be carefully considered. Such, for instance, are the conservation of natural resources; the elimination of unnecessary middlemen; the introduction of co-operation where economies can thereby be effected; improvement of banking systems; removal of high tariff walls, etc."

An International Committee for making a geographical survey of the world's treasures of material wealth, as outlined in Prof. Dickson's British Association address, might also be appointed, and thus a general "stock-taking" of the earth's natural resources be carried out at the same time that the important problem of the rise in prices is being investigated. The writer of this article supports both proposals, and trusts that during the next twelve months some progress will have been made in obtaining the co-operation of statesmen in the leading manufacturing countries for this important work.

TABLE I.—INDEX NUMBERS OF THE CHANGES OF LEVEL OF FOOD PRICES IN THE PERIOD 1900-1912.

Country.	Nature of Index Number.	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912
United Kingdom	Retail prices of 23 articles of food in London, weighted according to workmen's consumption	100	100	101	103	102	103	102	105	108	108	109	109	115
France	Retail prices of 24 articles of food (including wine), fuel and lighting materials in Paris, weighted according to workmen's consumption	100	100	95	98	99	97	95	100	102	100	104	117	115
Germany	Retail prices of 13 articles of food in Prussia, Bavaria, Baden and Wurtemburg, weighted according to workmen's consumption	100	103	106	105	105	114	118	116	116	124	127	128	(130)
Holland	Retail prices of 23 articles of food in 6 principal towns (unweighted)	100	100	100	102	103	102	103	105	107	109	115	117	123
Italy	Contract prices of 13 articles of food supplied to 43 State colleges in various parts of the country (unweighted)	100	100	99	99	97	99	99	101	105	112	114	118	120
Norway	Retail prices of all articles of food (26 specified) in Christiania, weighted according to workmen's consumption	...	100	99	99	97	100	103	108	109	106	108	111	119
Russia	Wholesale prices of 30 articles of food at representative markets (unweighted)	100	104	107	102	104	112	116	130	130	127	116	121	...
United States	Retail prices of 15 articles of food in 39 principal cities, weighted according to workmen's consumption	100	105	111	111	113	113	117	122	126	133	140	139	...
British Dominions: Canada	Wholesale prices of 78 articles of food (including fodder) at representative markets weighted according to national consumption	100	104	109	106	109	111	115	128	120	133	135	136	151
Australia	Retail prices of 41 articles of food (besides soap, starch, washing blue, kerosene and candles) in the 6 capital cities, weighted according to national consumption	...	100	109	105	95	101	101	98	106	104	103	103	116
New Zealand	Wholesale prices of 17 articles of food at representative markets (unweighted)	100	101	109	109	102	107	107	112	117	108	110	116	...

The Biggest Bird That Ever Lived

By R. W. Shufeldt, M. D.

DURING the Summer of 1913, while engaged in describing and photographing the specimens representing the fossil remains of vertebrates in the extensive collections belonging to the American Museum of Natural History, the United States National Museum, and the Peabody Museum of Yale University, I met with the fragments of the lower long leg bones that belonged to an extinct bird of enormous size. They were completely fossilized, and had been discovered by a member of the Expedition of 1912 sent out by the American Museum of Natural History in the Wasatch of Wyoming. Geologists are pretty well agreed that this particular region is some 2,500,000 years old.

These fossil remains consisted of two immense toe-joints and parts of the trochleæ of the tarso-metatarsus of an adult individual. The tarso-metatarsus in a bird's leg is the last of the three of the long bones of that limb; the trochleæ are those projections at its distal end which articulate with the toe-bones.

This was all that had been found of a bird giant which had flourished over two and a half million years ago in the central region of this country. It was not all that we knew about it, however; for, many years ago, the late Prof. Cope had described, in the *Proceedings* of the Academy of Natural Sciences of Philadelphia (1876, II) and subsequently in the Report of the U. S. Geographical Survey West of the 100th Meredian (Vol. IV, p. 70), the fossil remains of a bird of gigantic proportions, of which he said that "this species was of large size, the proximal end of the tarso-metatarsi being nearly twice the diameter of that of the ostrich. Its discovery introduced this group of birds to the known fauna of North America, recent and extinct, and demonstrates that this continent has not been destitute of the gigantic forms of birds now confined to the Southern hemisphere fauna." This distinguished palæontologist named this long-extinct species *Diatryma gigantea*, and considered it to be quite distinct from any of the existing true ostriches.

We know that an old male African ostrich will grow to be at least eight feet tall, and Cope surmised, in his description of *Diatryma gigantea*, that it was a bird twice the size of an adult ostrich; in other words, it may have attained a height of some fifteen or sixteen feet, or about three times the height of an ordinary man.

It would seem to have belonged somewhere in the group of great flightless birds with keelless sternums known as the *Ratitæ*, or in the Supersuborder *Dromæognathæ* of my own Classification of Birds. Doubtless it was ostrich-like in appearance while not directly allied to that genus, or still less to the moas of the New Zealand group of islands, of which there were some twenty species, now all extinct; of these *Dinornis maximus* was, without doubt, a bird that grew to be at least twelve feet tall, or four feet taller than the tallest of existing ostriches (Newton).

Upon comparing the fossil remains of this extinct bird of ponderous proportions, belonging to the American Museum of Natural History, with those of Cope's *Diatryma gigantea*, I at once recognized the fact that it, too, belonged in the same genus or the genus *Diatryma*, and I have since bestowed upon it the name *Diatryma ajax*. Upon measuring the bones and fragments of bones representing it, it was apparent that these were from a form considerably larger than Cope's *D. gigantea*, and could such a thing ever have happened as to have an old male African ostrich stand beside a full-grown individual of this extinct, gigantic bird of the Eocene of Wyoming, the former would have appeared, by way of comparison, a veritable pigmy in its proportions.

In order to appreciate the probable *size* of *Diatryma ajax* I have made a drawing for the purpose. The ac-

companying illustration is based on that drawing.

The representation of *D. ajax* here shown is intended merely to give its size and *height* as compared with an ostrich and a man, and in no way intends to be a *restoration* of this species; for, up to the present time, we have not the required fossil bones of either *D. gigantea* or *D. ajax* to give us any idea as to the *forms* they had. The illustration is merely a generalized ostrich form to give the reader an idea as to how it would have towered above any one of us or above an ostrich. As here represented, *D. ajax* would have been a bird about twenty feet in height, but if the shafts of the long bones of the leg were fashioned as they are in an ostrich and not as in a moa, it could easily have been a much taller bird than that—that is, it could have attained a height of between twenty-five and thirty feet.

Diatryma ajax, the extinct, ostrich-like bird of the lower Eocene of Wyoming, was a much larger and taller bird than Cope's *Diatryma gigantea*, and what is more, it towered above the *Dinornis maximus* of New Zealand, which was, for many years, the tallest extinct bird known to science.

The Decision in the Kodak Film Case

ON September 9th, 1913, an interlocutory decree was handed down in the case of the Goodwin Film and Camera Company against the Eastman Kodak Company. The question at issue was the validity of patent 610,861, granted to Hannibal Goodwin on September 13th, 1898, for "improvements in photographic pellicles and processes of producing the same," in other words, nothing more or less than the well-known kodak film. The court upheld claims 1, 6, 8 and 10 of the patent. The Eastman Kodak Company appealed from the decision, but on appeal the United States Circuit Court of Appeals for the second circuit affirmed it. The decision, written by Judge Coxe, upholding, as it does, a patent which covers a process that forms the basis of an enormously wealthy industry, is of such importance that we publish, in the following paragraphs, an abstract of it.

Hannibal Goodwin was a clergyman residing at Newark, New Jersey, for thirty years prior to his death, which occurred December 31st, 1900. His salary was small, and for ten years prior to his death he had no regular charge. He was interested in chemistry and spent much of his spare time in chemical experimentation and research. The necessity for a transparent, sensitive pellicle for use in roller cameras had long been felt, and Goodwin, though hampered by his inadequate surroundings, undertook the task of supplying it. The patent specification points out the manifest objections to supports of glass and of paper in combination with gelatin and other substances, and proceeds to state how they may be avoided. The patentee says:

"I have provided a pellicle the principal ingredient of which is nitrocellulose, or any equivalent . . . which is transparent, and insoluble in the usual developing, fixing and intensifying solutions or liquids used in photography. . . . In carrying out the invention, I provide a suitable surface, such as that of glass, and flow over the same a solution of nitrocellulose dissolved in nitrobenzole or other non-hydrous and non-hygroscopic solvents . . . and diluted in alcohol or other hydrous and hygroscopic diluent."

When dry, this solution forms a flexible transparent sheet or pellicle which is insoluble in any of the fluids employed in dry plate photography. The foil when stripped from the glass constitutes a supporting pellicle for the sensitive film. The specification states further that previous efforts to provide a transparent and flexible pellicle have been failures because they did not possess the properties of glass and were incapable of resisting the usual developing, fixing and intensifying solutions used in photography.

Hannibal Goodwin claimed that he had produced a film which is capable of resisting such fluids and of sufficient smoothness, hardness and toughness of surface for service in a roller camera. He said that in carrying out the invention he provides a suitable surface such as glass and flows over it the solution of nitrocellulose (as distinguished from "commercial celluloid") dissolved in nitrobenzole or other solvent not containing or capable of absorbing water. The equivalents for nitrobenzole are acetate of amyl and those non-hydrous, non-hygroscopic fluid solvents of nitrocellulose which do not mix with water, are not greasy, and are of slow volatility. Nitrocellulose when so dissolved and flowed over a smooth plate produces a smooth, transparent, imporous, impermeable film capable of being subjected to the photographic fluids without being affected thereby. It is further stated that the solution thus obtained by dissolving the nitrocellulose is diluted with alcohol or other similar diluent which serves to dilute or expand the volume of the dissolved nitrocellulose or increase its fluidity. The diluted solution is then applied to a smooth and hard surface, from which it may be stripped when dry.

The claims in controversy are as follows:

"1. An improvement in the art of making transparent flexible, photographic-film pellicles, the same consisting in dissolving nitrocellulose in a menstruum containing a hygroscopic element and an element which is non-hygroscopic, the non-hygroscopic element being, of itself, a solvent of nitrocellulose, and of slower volatility than the hygroscopic element, depositing and spreading such solution upon a supporting-surface, and allowing it to set and dry and harden by evaporation, and spreading a photographically-sensitive solution on the hardened film, and drying the film, substantially as set forth."

"6. An improvement in the art of making transparent flexible and elastic photographic pellicles, the same consisting in dissolving nitrocellulose in an eventual celluloidal menstruum which is anhydrous and non-hygroscopic, spreading such solution upon a supporting surface, allowing it to dry and harden, spreading photographically-sensitive matter, thereon, and again drying and stripping the pellicle from said support, substantially as set forth."

"8. The process of making photographic pellicles, which consists in subjecting nitrocellulose to the action of a menstruum combining fast and slow evaporating solvents, the slow evaporating solvent being non-hygroscopic and non-greasy in nature and quality, and acting as an eventual solvent as described, spreading the solution upon a support and setting the same by evaporation, then applying photographically-sensitive matter and stripping, all substantially as set forth."

"10. As a new article of manufacture, a transparent film-support for photographic purposes, the same consisting of a thin, non-greasy, film, foil or pellicle of a dried and hardened celluloidal solution of nitrocellulose, combining in addition to the following essential properties of glass-plate supports, viz., insolubility in developing fluids, insensibility to heat and moisture, imporosity of structure, and hardness, smoothness, and brilliancy of surface, the further desirable properties of exceeding thinness, lightness in weight, toughness in texture and elasticity in flexure as and for the purposes specified."

"12. The process of manufacturing photographically-sensitive pellicles, consisting of flowing a non-photographically-sensitive solution of nitrocellulose dissolved in a non-hygroscopic liquid, or a liquid which is eventually non-hygroscopic, and drying and hardening such compound into a support for the photographically-sensitive emulsion and imposing on such support the said sensitive emulsion, substantially as set forth."

Claim 10 covers the film support as a new article of manufacture, and the other claims cover the process by which the pellicle is produced.

An examination of the first claim will demonstrate sufficiently the various steps of the Goodwin process for making a transparent, flexible photographic-film pellicle.

At the time of Goodwin's invention, the art was vehemently demanding, as a substitute for the glass plates then in use, a transparent photographic film capable of supporting the sensitive emulsion necessary in photography, and also capable of being rolled up. Goodwin entered the field as an inventor, for the sole purpose of overcoming the difficulties then existing, and he did so when, speaking broadly, he discovered the process of dissolving nitrocellulose in a menstruum containing nitrobenzole and alcohol or their equivalents, and then spreading the sensitive emulsion on the hardened film. He was subjected to almost unprecedented delays and disappointments in the Patent Office, which it is unnecessary to consider in detail, but he held tenaciously to his original conception of the invention.

There is no proof in the record to support the contention that his process was known by others prior to the date of his application. On the contrary, the necessity for the patented pellicle became more and more apparent and the demand for it more and more insistent, and many efforts were made to meet the demand, but with partial success only.

In 1887 an article appeared in the *Photographic Times Almanac* in which a well-known authority on photographic subjects, Andrew Pringle, points out the pressing needs of the art in language which is prophetic of the Goodwin invention. He says:

"When we get a support such as I have indicated, transparent, flexible, and in lengths, tourist photography will make a stride that will throw into obscurity all previous advances."

And yet at the time this article was published, there was in the Patent Office an application showing that this stride had actually been taken.

It is unnecessary to advert to the other evidence in the record showing priority of invention in Goodwin. In addition to the presumption arising from the patent itself, we have his clear description of the process which any intelligent chemist would understand and which, if followed, must produce the desired film. Stripped of the unnecessary technical verbiage, which was largely produced by the proceedings in the Patent Office, Goodwin's statement is so plain that it would seem that a neophyte might follow the instructions successfully.

Goodwin's application, as filed in 1887, disclosed, for the first time, the fundamental and essential features of a successful, rollable film. Nothing in the prior art shows Goodwin's process and the proposition that any skilled chemist, familiar with the art as it existed prior to May 2nd, 1887, could construct the Goodwin pellicle cannot be maintained. The defendant's brief says:

"The Eastman Company, in 1888, devised and introduced its first 'Kodak' camera. . . . This 1888 Kodak . . . marked the beginning of amateur photography."

but it is not pretended that a film other than one having a paper support coated with sensitized gelatin, was used prior to Goodwin's invention, or, indeed, prior to May 2nd, 1887. The proposition that these paper films were used because they were inexpensive and thus available for trying out the film-roll system is not persuasive.

The Eastman Company did not commence its experiments, looking to the substitution of pyroxyline for paper, as a film support, until the latter part of 1888. These experiments were continued by Henry M. Reichenbach, the company's chemist, until February, 1889, and on April 9th, 1889, he filed his application for a patent as assignor to the Eastman Dry Plate and Film Company, and promptly received a patent dated December 10th, 1889. During all this period beginning with the experiments and ending with the patent, Goodwin's application was lying in the Patent Office. It may be that his process was an improvement on Goodwin and that during the life of his patent he was entitled to the exclusive use of such improvement, but it can have no retroactive effect, it cannot destroy or limit an invention which was *in esse* before his invention was conceived.

There is no evidence that anyone ever did make the Goodwin pellicle prior to his invention, and the court was convinced that no one could have made it by following the direction of Parkes or David (cited in reference of the defendant).

It is unnecessary to consider the question of invention in all the details pointed out in the defendant's briefs, for the reason that Goodwin was the first to dissolve nitrocellulose in nitrobenzole or its equivalents diluted in alcohol or its equivalents. This being so, his patent is entitled to a construction broad enough to enable its owner to reap the profits which naturally and fairly belong to the invention. The invention is one of more than ordinary merit, and the claims should not be so construed that anyone may safely infringe who has wit enough to substitute equivalents for the elements named in the patent, and to add or subtract therefrom, so long as the menstruum contains a hygroscopic and a non-hygroscopic element, the latter being a solvent of nitrocellulose and of slower volatility than the former. If the defendant uses a process having these elements, it matters not what else it uses or that its method is an improvement on the patented method.

It is not necessary to enter upon a discussion of the Reichenbach interference further than to say that this, as well as most of the complications in the case, would have been avoided had the Goodwin patent gone to issue in due course, as it should have done. The long delay and the contradictory rulings of the Patent Office would have discouraged an inventor who had not supreme faith in the justice of his cause. If Goodwin made a generic invention it follows that he is entitled to hold as infringers those who used the equivalents of nitrobenzole and alcohol. In the process of the patent and of the defendant nitrocellulose is used. In both it is dissolved in a menstruum containing a high-boiling, non-hydrous, non-hygroscopic solvent like nitrobenzole or its equivalents and a diluent like alcohol or its equivalents. In both the processes of the defendant, nitrocellulose is dissolved in a menstruum consisting of a high-boiling, non-hydrous, non-hygroscopic solvent and a diluent of wood alcohol. In the process of 1898, the solvent was amyl-acetate 5 parts, fusel oil about 16 parts and camphor 3 to 5 parts. The diluent was wood alcohol 104 parts. In the 1902 process, the solvent was fusel oil 16 parts and camphor 3 parts. The diluent was wood alcohol 40 parts and acetone 40 parts. There can be no doubt that the defendant uses nitrocellulose and the diluent of the patent, viz., alcohol—wood alcohol being expressly referred to in the patent as an example of a diluent having a low boiling point and a relatively quick evaporating quality. The only debatable question relates to the equivalency of the defendant's solvent and it cannot be doubted that the combination of fusel oil, camphor and amyl-acetate of 1898 process and the fusel oil and camphor of the 1902 process are equivalents of the high-boiling, non-hydrous, non-hygroscopic solvent of the patent. It matters not that the defendant's process produces better results than that of the patent. Assuming this to be true, it does not give the defendant the right to use Goodwin's discovery because it has introduced improvements. It would be strange, indeed, if during the fifteen years which elapsed from the date of the Goodwin application to the adoption of the 1902 process there had been no progress in the art. Undoubtedly there was progress, but one cannot use a patented invention because he has improved it.

Goodwin was the first to produce a transparent sensitive pellicle for use in roller cameras. The conclusion naturally follows that his patent is entitled to a liberal construction. Doubts should be resolved in its favor, and care taken not to confuse the art at the date of issue with the art as it existed at the date of the application, eleven years before. So considered and construed, the claims in controversy are valid and infringed.

A Bottle-stopper that Locks

A BOTTLE stopper that locks is a recent Paris idea, and will be very useful for keeping fine liquors and the like out of the reach of persons for whom they are not intended. It can also be used for protecting inflammable or dangerous liquids so as to avoid accidents. A metal cap fits over the bottle neck, and it has a small felt-lined collar inside which serves to fit around the rim of the bottle. The collar is pressed on by turning a winged nut, and when all is in place, a small arm comes down alongside the wing of the nut so as to allow of running a padlock through the two holes. This prevents any turning of the screw and keeps the bottle tight shut.

Kinematographing the Matterhorn

A Daring Ascent in a Feat of Endurance With Weighty Apparatus

By the English Correspondent of the Scientific American

Starting upon the descent from the crest.

AMONG the many peaks forming the Alpine chain of Switzerland, which are so familiar to the tourist, the Matterhorn never fails to compel attention from its peculiar pyramidal formation, jutting in stately loneliness above its rugged fellows. It is a peak which possesses unfathomable fascination to the mountaineer, owing to the extreme difficulty and danger in scaling its crest, and because of the atmosphere of tragedy with which it is invested. It was not until July, 1865, that its topmost rock was trodden by human feet, and that pioneer effort made by Whymper proved most disastrous, inasmuch as four of the party fell 4,000 feet and were dashed to pieces.

Although, since that tragic year the mountain has been scaled upon numerous occasions, yet it is a feat which must not be attempted by any but the most experienced climbers, and then only with the assistance of thorough expert guides. The latter, cognizant of its fearful steep precipices and menacing crags, will not essay the attempt unless the mountain is in first-class condition, and the weather is fine. To-day the peak, which rises to an altitude of 14,705 feet, may be ascended upon three sides, and the route followed is determined by prevailing conditions. However, it is by no means unusual for a party to be held up for three or four weeks by adverse weather conditions upon the higher reaches, and, frequently, an expedition has to be abandoned entirely, owing to the brief duration of the climbing season.

Therefore, when Mr. Frederick Burlingham of the British and Colonial Kinematograph Company, who is himself an expert climber, intimated his intentions to make an ascent and to kinematograph the peak during the climb, his proposal was received with ridicule. At least two days would be involved in the task, and there was every possibility of the party becoming stalled, in which event a serious situation would be precipitated. Then again, the weight of the apparatus necessary for taking the "movies" served as an additional deterrent. The majority of climbers, owing to the difficult character of the ascent refuse to be hampered in any way whatever; they even will decline to take a snap-shot camera with them.

The kinematographing suggestion certainly was somewhat daring, inasmuch as bulky and weighty apparatus would be unavoidable. Mr. Burlingham secured the lightest and most reliable instruments he could find, but even then the weights could not be kept down very much. The camera itself weighed 33 pounds, the tripod 22 pounds, while the film and spool boxes brought the complete weight to nearly 70 pounds. This was above that which was absolutely indispensable in the outfit to be carried, such as ropes, extra clothing, provisions, and refreshment.

The operator secured the assistance of two of the most reliable guides in Switzerland. The leader, Gabriel Zumtangwald, accompanied Mrs. Bullock Workman on her expedition to the Himalayas, while Heinrich Julen was familiar with the Swiss mountains through and through. In addition, two first-class porters, who were also expert climbers, accompanied the party to carry the apparatus, and they all succeeded in accomplishing a feat of endurance which has never been equalled in the playground of Europe.

The guides and porters, although willing to make the attempt, frankly stated their convictions that the effort would prove a failure, and did not hesitate to point out the many and extreme dangers attending the task. However, the operator would not be dissuaded, and accordingly the itinerary was mapped out very carefully.

Climbing the "shoulder" of the Matterhorn.

It was decided to climb the mountain upon the Zmutt side and Zermatt (5,315 feet) was selected as the starting point. Here the party remained, watching the barometer and the behavior of the weather on the mountain top. For two days the crest was assailed by a terrific gale, which blew away the freshly fallen snow in clouds, and this tempest was followed by two days of perfect sunshine. The barometer standing very high and steady, the party decided to start on July 1st, and to push ahead so as to gain the Matternhorn *cabine* at 10,745 feet the same day, and to spend the night in this elevated hostelry.

In order to conserve the energies and endurance of the porters, it was decided to load the equipment upon three mules and to drive them as far as possible up the mountain side. They started off amid the cheers of a huge crowd.

The going at first was easy, the party reaching the Schwarzsee hotel, having luncheon and leaving at 1:30. The path lay over the dangerous Hörnli ridge. This trail winds along the brink of forbidding precipices, and, at the most awe-inspiring places, moving pictures were taken to demonstrate the partiality of the mules for the outer edge of the trail, which has often been described, but which those who have never been on a mule's back among the mountains scarcely can believe. The explanation however is simple. The animal takes the more dangerous-looking part of the narrow path merely to prevent his load knocking against the mountain wall on the inside.

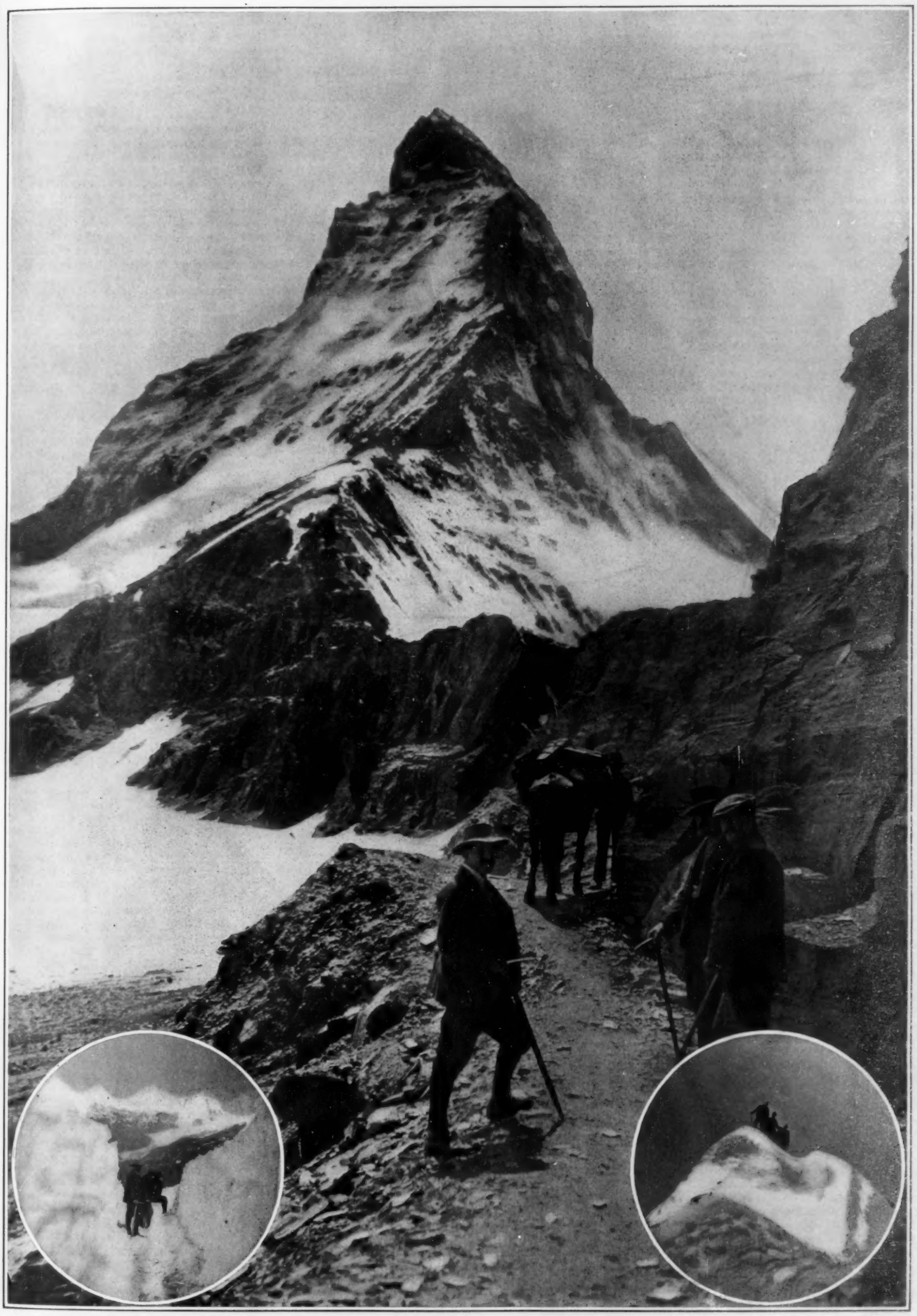
The party did not succeed in traversing the Hörnli ridge very far by animal effort. First two mules were turned back, and the journey resumed with one. But the snow became so deep that this animal floundered hopelessly, and at last, was abandoned, the two porters shouldering the weighty and cumbersome apparatus, while the others assumed their proportions of the remaining equipment. Progress was somewhat slow as the ridge was covered thickly with snow and ice, and this state of affairs did not augur well for the attack upon the peak proper the next day.

Although the going was difficult the *cabine* was reached early in the afternoon. This hotel, at more than 10,000 feet above the sea, is impressive in its loneliness, and like all elevated hostelries provided essentially for the convenience of the daring, has its own peculiar tariff. The room costs $5 a night if no food is supplied, but if the latter is partaken beneath its roof, and charged extra, the cost of the room is $2.50. But, seeing that every ounce of provisions as well as wood has to be brought up by porters, and taking into consideration the limited number of guests, the charges are not high.

The climb proper was commenced early the next morning, the party setting out at 2:30 A. M.—an hour later than had been arranged. The stars were shining brightly, the wind had blown itself out, but the cold was intense. Roped up and armed with lanterns, the party proceeded to make their way up the ice-covered crags. Climbing amid such dangerous surroundings, the flicker from a hand lantern produces strange sensations in the mind of an amateur, but to the experienced mountaineer it offers little disadvantages, although a few minutes must elapse before one becomes accustomed to the glimmer. The party soon found that the peak was far from being in a condition conducive to rapid traveling, as, in the darkness they had to cut their way step by step through some of the most dangerous places, with a sheer drop of hundreds of feet onto the glaciers looming out indistinctly below.

Despite the hindrances, smart progress was maintained; in fact, the guides themselves urged a slower pace, as the rarified air was somewhat exhausting. Indeed, Burlingham, the operator, lost his breath at this point, and did not regain it full until he once more

(Concluded on page 254.)



Pyramidal aspect of the superb Matterhorn as seen from the Hörnli Ridge. Party and mule with outfit. Insert at the left shows the deep snow on the Hörnli Ridge, where mule had to be abandoned. The one at the right pictures the party at the summit of the peak.

KINEMATOGRAPHING THE MATTERHORN.

The Problem of Our Navy

IV.—The Price We Pay for Self-sufficiency and Unpreparedness

By the Editor

THE present indifference to the naval and military needs of the country is traceable to several causes and conditions, first among which we do not hesitate to place the biased and one-sided historical teaching given to our children in the public and high schools, supplemented, it must even be admitted, by that of some of the text books of our higher institutions.

The inculcation of the doctrine of American invincibility begins with the instruction of the American "Schoolmarm"—efficient and worthy though she is—and one lasting result of her patriotic fervor is that the average American youth passes out into the work-a-day world with the deeply-ingrained belief that, since the United States has emerged victorious from every conflict in which it has been engaged, it is practically invincible, and therefore may contemplate any possible wars of the future with the conviction that the defeat of the enemy is inevitable.

Nevertheless, it is a fact that *not once in its history has the naval and military strength of the United States been put to the supreme test against a first-class power.*

The war of 1812? No, not even then; for at that time Great Britain was engaged in the stupendous struggle of the Napoleonic wars—she was fighting for her very existance, and the storm center lay not in the New World, but the Old. The Mexican war of 1848 was waged against a feeble State; and not much stronger was Spain in 1898.

The misleading tuition of the schoolroom is subsequently aided and abetted by a perfervid political oratory, under the spell of whose sonorous and impassioned sentences the successes of our wars are apt to be swelled to an importance far beyond their merits, and their failures absolutely ignored.

And lastly, there is the daily press, which seemingly is unable to record the simplest military exploit without suffering from an acute attack of superlativitis, and under whose facile pen an affair of outposts becomes a serious engagement, and a skirmish expands to the dignity of a battle big with the fate of nations.

Some day, someone will write the story of the great battles of the world from the viewpoint of the inefficiency of the losing side. When that is done, there will be a sensational readjustment of values. It yet remains for some competent critic, preferably a civilian, to write such a history of the Spanish-American war, and prove how greatly the woeful inefficiency of the Spanish navy facilitated the victories of our own. It may be said of the enemy that from the opening gun at Manila to the capitulation at Santiago, he literally "did the things he ought not to have done, and left undone the things he ought to have done." This is well understood by our naval officers. Although the navy lived up to its fine traditions, and both officers and men won every distinction that the opportunities of the war may have offered, we have frequently heard these same officers deplore the fact that the American public was liable to draw exaggerated conclusions from the victories of Manila and Santiago. Thus we learn from "War-time in Manila," a recent book from the pen of Rear-Admiral Bradley A. Fiske, who took part in the battle of Manila Bay, that the Spanish admiral might have rendered Dewey's expedition not only futile, but overwhelmingly disastrous, if he had but placed his fleet under the protection of the powerful modern guns of Manila city, instead of under the forts of Cavite. Here is the situation as described in the Admiral's own words:

"Now what would have happened if the Spanish had put their fleet close in front of the city, as we expected they would do? The conditions for firing would have been almost perfect on the solid protected positions of the shore guns. . . . One hit from one of those 9.2-inch guns would have done irreparable injury to any American ship, because no American ship was armored and we had no means of making repairs. Almost any such hit would have sunk the "Petrel" or disabled any of the other ships. . . . We should have had to fight a much longer time to destroy the Spanish ships, and during every instant we should have been exposed to a much greater volume of fire. We would have received tremendous injuries. If the Spaniards had done as they should have done, and blown up the machinery in the Arsenal, where would we have gone to repair our injuries? San Francisco was 7,000 miles away. Note.—Since writing the words above, fifteen years have gone by. *My present opinion is, and has been for several years, that if the Spaniards had placed their fleet where it would have been supported by Manila's guns, they would have sunk every American ship. Dewey could not have retreated fast enough to save his ships, after the injuries had once begun to arrive; and even if he could (and would) whither would he have gone?*"

From a Contemporary Aquatint.

"A war of arms, brought on by a programme of peace."—WOODROW WILSON.

Duel between "Chesapeake" and "Shannon."

So also at Santiago. Not alone were our ships overwhelmingly superior in size and gun power, but the Spanish admiral, instead of scattering his ships in different directions, as he should have done when he emerged from the harbor, strung them out along a lee shore and in such a position that they could not maneuver. The American fleet was able to choose its own distance and batter the Spanish cruisers to pieces under all the easy conditions of a summer target practice. It may be said of the Santiago as of the Manila fight that it was a battue rather than a battle.

Now let it be clearly understood that the facts we have given above are quoted, not with the purpose of detracting from such credit, and there is much of it, as is due our Navy for its overwhelming victories, but merely to establish the truth that never, as yet, has the modern American Navy been put to the supreme test of engaging, with equal forces, a first-class naval power; and that *to imagine we can afford to enter into a future war without matching ship with ship and gun with gun in equal strength and with equal numbers, is to lend ourselves to a delusion and a snare.*

True it is that in the war of the rebellion we established our standing as a great military nation; but so far as that war affects the problem of our Navy, its one great lesson is that of the enormous folly and the stupendous extravagance of our drifting along in a chronic condition of unpreparedness for war.

For if the country had possessed an adequate navy, fully manned and equipped, the war, instead of dragging its weary length through four long years, with their enormous sacrifice of life and treasure, might have been won in six months' time. The South sent out its merchandise and received in exchange the munitions of war through its Southern ports. Had the Government possessed an adequate navy, these ports would have been shut in at once by a strict blockade; and the sheer lack of the munitions of war would have forced the South to a speedy capitulation. As it was, our chronic state of unpreparedness imposed upon the country the gigantic task of creating in time of war both the naval and military forces that were necessary to push the war to a successful issue.

In no sphere of human activity does the "penny-wise pound-foolish" policy demonstrate its inexcusable and costly folly so clearly as in this matter of naval and military preparedness. Times without number, history has proved that an efficient navy is a most economical investment; and that "a war of arms brought on by a programme of peace," as President Wilson has characterized the war of 1812, is a policy of the wildest extravagance.

There have been periods in the history of this country when the provision of the moneys necessary to build, equip and maintain a fleet adequate to its necessities, would have proved to be a venture yielding one thousand per cent on the investment.

Is the statement disputed? Then look at our annual pension roll of $180,000,000—a legacy of our unpreparedness! *The total cost of pensions to date, due to the civil war, has been four thousand millions of dollars—sufficient to have built nine dreadnoughts per annum for the past forty-seven years.* The pension appropriation for 1914 will be about $180,000,000; an annual draft on the Treasury which would suffice to build about nineteen superdreadnoughts.

First cousin to the popular belief that our record in war shows us to be invincible is the equally foolish belief that the mere possession of dollars and men, pride and pluck, suffices to make us a first-class military people. It is positively amazing that in a country which leads the world in the number and excellence of its schools, the magnificence of its public libraries, and the far-reaching activities of its daily press, there should still prevail a widespread belief that the naval and military strength of this country can be expressed in terms of its area and population, the undeveloped resources of its mines, farms, and forests, and the length of its roll-call of multi-millionaires.

How many of the people of this country understand that our vast national wealth in its present undefended condition, and our commanding geographical position, by exciting the cupidity and the jealousy of rival States, are a positive source of weakness and a powerful predisposing cause to a war for which we are ludicrously unprepared.

The day of undisciplined levies and extemporized navies has gone by, never to return; for the trend of naval development in the past few years has been such as to put a heavy premium upon preparedness and a heavy discount upon the mere possession of the raw materials of war. It takes three years to build a battleship and another year to get it into efficient fighting condition; it takes four years to produce an efficient gunner or petty officer, seven years at Annapolis and aboard ship to bring a junior officer up to full efficiency, from twenty to twenty-five years to produce a captain equal to the command of a battleship, and from twenty-five to thirty-five years to produce an admiral equal to the enormously complicated and difficult task of carrying a huge modern fleet successfully

through a naval campaign. The naval wars of the future will be short, sharp and decisive. They will be decided just as soon as the far-flung screens of scouts and cruisers have got in touch with each other, and have brought their respective fighting lines of dreadnoughts together. When that has been done, *the fate of the contending nations will be a matter not of days or even of hours, but of minutes. The battle of Tsushima, which brought Russia to her knees, was won in forty-five minutes from the firing of the first gun!*

War is infinitely more costly than battleships; and both history and common sense combine to teach us that there is no agency so potent in preventing war as a battleship line sufficiently strong to preserve the peace. It is the magnitude and preparedness of the German naval and military forces that has secured to Germany the forty years of unbroken peace, during which that country has so greatly developed its home industries and built up a merchant marine that is the wonder and admiration of the world. (Thanks to our geographical position we need carry no such burden of military forces as Germany—an adequate navy will give the needed security.) It is the realization by Great Britain of the importance of the command of the sea as expressed in her magnificent navy, that has made her the dominant world power and maintained her shores inviolate for centuries against the racial hatred and the military ambitions of the great powers of Europe.

The policy which has led Great Britain to build up her enormous navy is a policy not of war but of peace. Had she restricted her naval appropriations as we have done, she would long ago have been plunged into a war, the cost of which, in loss of ships and commerce, would have paid for her navy, great as it is, ten times.

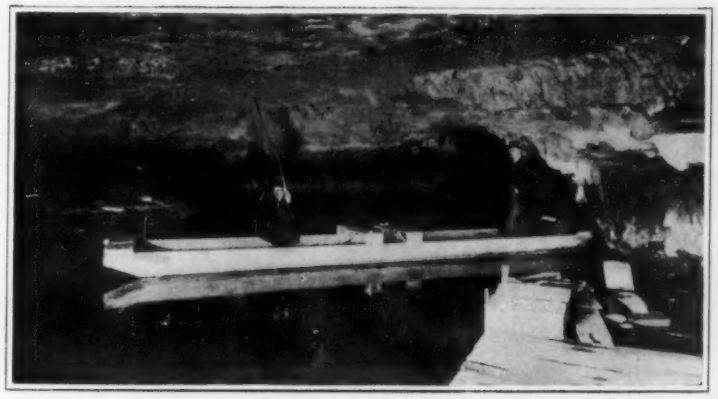
And what of ourselves? Shall we lay to heart the lesson of that stupendous pension roll of $180,000,000 and hasten to bring up our navy to a standard of strength that will insure a lasting peace, or shall we, as in 1812, drift into another "War of arms brought on by a programme of peace?"

Crossing the River on a Wire

THE primitive bridge herewith illustrated is one which was made for practical use by a party of government surveyors in the Rocky Mountains, and is illustrative of the difficulties which are being constantly met and overcome by such "advance guards of civilization." It consists of two strands of telephone wire, borrowed from the Forest Service, stretched between two trees. The "bo's'n's seat" and "trolley" consist of a loop of the same kind of wire and a billet of wood. The bridge served for the transportation of a crew of men with instruments and supplies for several days work.

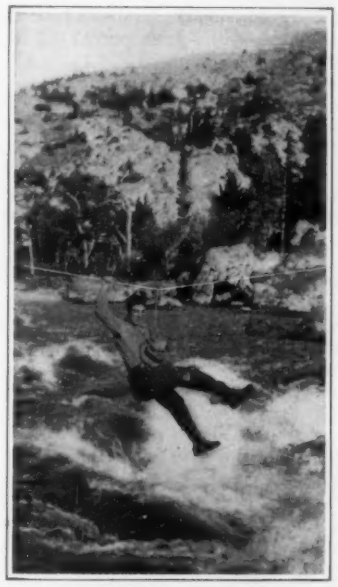
Ticket-printing Machine

IN Europe, railroad tickets are now being printed by machine, upon a blank card, the moment they are delivered by the ticket office. The accompanying photograph illustrates a ticket-printing machine that is in use in a number of the large depots in Germany, and in England and the colonies. On the old method, the railroad company had to print and keep in stock a large number of tickets, and as these represented a great money value, they had to be stored and watched closely so as to avoid losses. Now the use of the machine overcomes all difficulties from this cause, for the tickets are printed only at the moment they are called for. When we consider that the machine shown in our photograph is able to hold 4,000 different printing plates, such as are needed for all the destinations, it will be evident that some ingenuity is needed to make up such an apparatus. The carriage which slides along the top is used for the printing, and a blank ticket is fed into a slot in it. Working the top handle causes one of the printing plates to rise up out of the bottom box or cylinder and enter the pointer, it being pressed upon the ticket so as to print it with the destination, price and other data, then another operator withdraws the ticket and hands it to the buyer. In the lower cylinder are numerous rows of plates all around it, and working a pedal causes an electric motor to bring the desired row to the top, at the same time working the name-bearing top cylinder, seen in the rear, by chain drive. The row of names is first brought under the pointer by proper rotation, then the carriage or printer is slid opposite the required name in that row. The carriage is now just over the right printing plate, so that working the handle causes the plate to rise, as we have seen, and allow of printing the ticket.



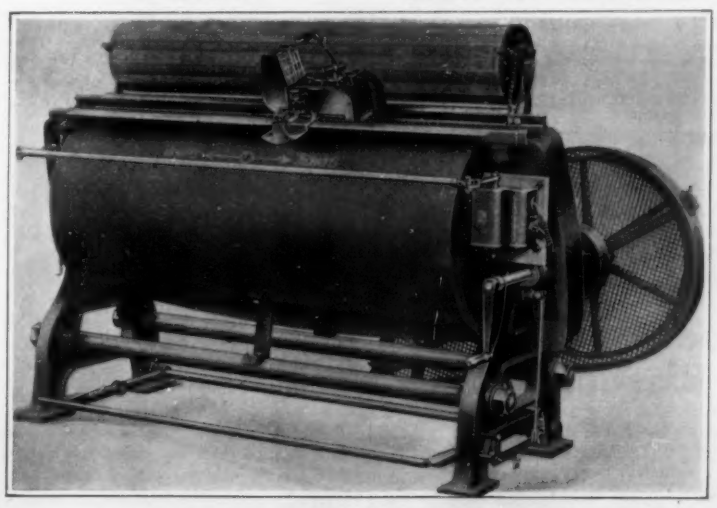
The cave farm is entered by means of a scow.

Mushrooms thrive in the humid cavern.



Emergency bridge used by Government surveyors.

Flexible-back hack-saw blade supporting a weight of 282 pounds.



A machine for printing railroad tickets as needed.

Farming in a Cave

A CAVE in the heart of the Ozark Mountains of Missouri is the unusual spot chosen for a farm by a retired citizen of St. Louis. While looking about for a farm in the western part of his home State, Mr. Robert Smith found an attractive 26-acre stretch, beneath part of which lay a large cave. Remembering the profitable use made of caves by the mushroom growers of southern France, he determined to test the productiveness of his acquisition.

Preparations for the experiment were simple. He first constructed a 25-foot flat-bottomed boat, for his only practicable access was by a small river running through the cave. Then while his neighbors were digging up weeds and clearing brushwood from their lands, Farmer Smith had to uproot and haul away the stalagmites and stalactites, the lime deposits left by the incessant dripping of water during many centuries. Except for a clayey substance, ocher, which covered part of the walls, the cavern floor was bare limestone, so that the final preliminary activity was to spread soil and manure over the ground.

Mushrooms are peculiarly suitable for such a project as the cave farm. The spawn is secured in bricks, which are broken up and scattered over the floor surface. From a single mulching, and with almost no care, the farmer can harvest a new crop of marketable mushrooms every day for three months. Allowing a brief period for the fungus to attain its full size, Mr. Smith can readily plant spawn three times each year. From this promising start, the subterranean agriculturist turned naturally to rhubarb and celery. These are planted above ground, and are later transplanted in the cave. The underground ripening causes an unusually rapid growth, the rhubarb gaining on the average an inch a day in length, and also gives the stalks a superior tenderness and a rich flavor.

Besides the crops which the Missouri farmer is now producing regularly, the cave, with its fixed quantity of moisture and its temperature which never varies from 60 degrees, is better than a man-made cold storage house for keeping vegetables fresh indefinitely. So quickly did this condition become evident that all the farmers within a radius of 20 miles now store their sweet potatoes in the cave for periods as long as two years.

A Remarkable Hack-saw Test

THE accompanying illustration shows a most interesting test of a hack saw in which a flexible-back blade supported two men, one weighing 147 pounds and the other 135 pounds, or a total of 282 pounds, without breaking. It is maintained that the best hack saw should have a soft flexible back with hard or tempered teeth. Often hack saws are operated at about as much as 150 strokes per minute, the operator forgetting that it is action and not speed that does the work. This is one of the most frequent abuses to which shop men subject a hack-saw blade.

The best speed for the blade is claimed to be from 40 to 60 strokes a minute, and no blade will stand higher speed without danger. The exact speed at which a blade should be run depends upon the material being cut. The harder the metal, the slower the speed should be. The operator should run the blade slow enough to feel the teeth take hold, as when filing. If a cut must be made quickly, some sort of liquid on the blade such as a soap solution or lard oil should be used.

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Kinematographing the Matterhorn

(*Concluded from page 250.*)

returned to the lower levels. The guides, although experienced to the conditions, also showed signs of distress, and the weight of the outfit was beginning to be felt. According to the regulations concerning the carriage of baggage upon Mont Blanc, the maximum load permitted per man is 10 kilogrammes (22 pounds): here there was about 50 per cent excess. As a matter of fact, two additional porters should have been requisitioned.

As the sun rose the party reached the abandoned club hut on the mountain. It is merely a box upon a shelf of rock. A second breakfast was partaken, and then it was decided to shed everything that could be spared. Practically all the food—for five—was left at the cache as well as other equipment. Slender supplies of a light wine were carried as there is no possible chance of quenching thirst above the *cabine*.

Beyond the hut comes the stiffest part of the climb: a toil up a 70-degree slope of ice and snow. The leading guide paused, shook his head, and emphasized the dangerous condition of the mountain. But Burlingham would not turn back. They cut steps every inch of the way, and this labor at such an altitude proved so extremely tiring that the advance was now exasperatingly slow. There was the danger that the summit would be reached too late to permit the descent to be made before darkness set in. When the "shoulder," which is a long steep ice slope, was reached, and a violent gale was encountered, the guides betrayed by their faces that they hesitated to go any farther. The air-current was whirling so viciously that it threatened to blow the whole party off the mountain. Moreover, the wind picked up small particles of frozen snow and hurled them against the men with blinding force. As it was, their faces were so filed by these driving granules that the skin was greatly irritated, and the discomfort was intense.

The arrangements provided for a respite of some 15 minutes at this point, but the situation became so alarming that the leading guide braced the party together, and told them to make a rush to the rocks above, where shelter might be obtained. The order was answered, and the kinematographing of this part of the journey conveys a striking impression of the dangers attending the climb. The operator set up his instrument, and one guide, to whom he was roped, used his body as a brace to support the tripod, while with his hands he clung to the operator's knees to prevent his being blown off his perch, and to frustrate any false movement, as the position was on a narrow ledge overlooking a drop of 3,500 feet. In fact, Burlingham became so absorbed in his work as to forget his perilous position, but this was brought home to him in a startling manner. He moved slightly to swing his camera round, and in so doing came to the edge of the precipice. Immediately a huge mass of snow and ice went overboard with a resounding crash, and had it not been for the strength of his assistant he must have gone too.

The wind gave no signs of abating. The party had been climbing for 8½ hours, and were still far from the summit. One and all were blowing from their efforts. Zumtangwald took a look round and expressed his opinion that it would be inadvisable to go any farther. Burlingham, with the summit almost within his reach did not relish the prospect, and so, when he remarked "Very well, but if we go back we shall have to make another attempt" his companions decided to push a little farther ahead, and if the conditions did not improve, to retreat. They had no desire to repeat the ascent as its dangers and difficulties had been revealed only too potently.

Curiously enough, after another fifteen minutes' hard toiling, a point was gained above the air current where virtual calm prevailed. Above the "shoulder" there are several permanent cables, knotted rope and wire to assist ascent. By their aid faster progress was made. Gaining the upper level they passed the spot where the four

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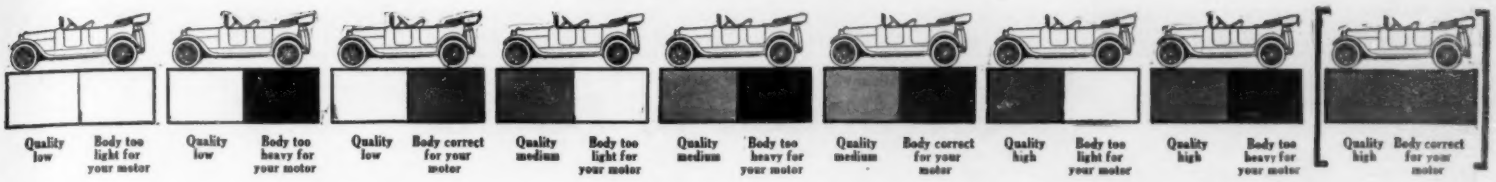

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That is conservative.

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There are also many variations in the *body* of oils.

Only one is correct for *your* motor.

There are also many variations in *quality*. But under the heat of service in your motor, only one *quality* will show maximum lubricating efficiency.

What if your oil is below the highest *quality* or incorrect in *body?*

Loss of power or undue friction, or both, must result. Repair bills follow.

Consumption of gasoline and oil mounts up.

Two motor demands

You may "want" correct lubrication. But you will seldom get it by chance.

It is of the utmost importance that you find the oil whose *body* suits your motor and whose *quality* offers the highest protection after the oil has been distributed.

It is now generally known that oil of correct body for your car can be determined only by detailed motor analysis—backed by scientific lubricating experience.

How friction hides

We are sometimes asked why incorrect lubrication does not always show up quickly in a motor.

That is an interesting question.

Some years ago motor parts were more exposed. Cars were often under-powered. Noise, overheating and loss of power gave the motorist timely warnings to investigate his lubrication.

But today most motors are amply powered and are largely closed in. Loss of power may not be noticed. Sound is deadened beneath metal jackets. Parts are frequently out of sight and hearing.

It is much like smothering an alarm-clock gong under a pillow.

The *noises* of friction are now partly smothered. But the *friction* still exists.

There is only one safeguard against undue friction—*correct lubrication.*

The solution

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Gargoyle Mobiloil "E"
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A guide to correct Automobile lubrication

Explanation: In the schedule, the letter opposite the car indicates the grade of Gargoyle Mobiloil that should be used. For example, "A" means "Gargoyle Mobiloil A." "Arc." means "Gargoyle Mobiloil Arctic." For all electric vehicles use Gargoyle Mobiloil "A." The recommendations cover both pleasure and commercial vehicles unless otherwise noted.

MODEL OF CARS	1910		1911		1912		1913		1914	
	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Abbott Detroit	A	Arc.	A	Arc.	A	Arc.	A	Arc.	Arc.	Arc.
Alco	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	....	....
American	A	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Autocar (2 cyl.)	A	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
" (4 cyl.)	A	E	A	Arc.	A	Arc.	....	....	....	....
Avery	A	E	A	E	A	A	A	A	A	A
Buick (2 cyl.)	A	A	A	A	A	A	A	A	....	....
" (4 cyl.)	Arc.	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Cadillac (4 cyl.)	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Cartercar	A	E	A	E	A	E	A	E	Arc.	Arc.
" Com'l.	A	E	A	Arc.	A	Arc.	A	Arc.	....	....
Case	....	....	A	A	A	Arc.	A	Arc.	A	Arc.
Chalmers	Arc.	Arc.	A	Arc.	Arc.	Arc.	Arc.	Arc.	A	A
Chase	B	B	B	B	B	B	B	B	B	B
Cole	Arc.	Arc.	A	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Delaunay-Belleville	B	A	B	A	B	A	B	A	B	A
E. M. F.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	....	....	....	....
Fiat	A	A	B	A	A	A	B	A	B	A
Flanders	E	E	E	E	Arc.	Arc.	....	....	....	....
" (6 cyl.)	....	....	....	....	....	....	Arc.	Arc.	....	....
Ford	A	Arc.	E	E	E	E	E	E	E	E
Franklin	B	Arc.	A	Arc.	A	Arc.	A	Arc.	A	A
" Com'l.	B	A	B	A	A	Arc.	A	Arc.	....	....
G. M. C.	....	....	....	....	Arc.	Arc.	A	Arc.	A	Arc.
Havers 6-44	....	....	A	Arc.	A	Arc.	A	Arc.	A	A
Havers 6-60	....	....	....	....	....	....	....	....	Arc.	Arc.
Haynes	A	E	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Hudson	Arc.	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Hupmobile "20"	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	....	....
" "32"	....	....	....	....	....	....	A	Arc.	A	Arc.
I. H. C. (air)	....	....	....	....	....	....	B	A	B	A
" (water)	....	....	....	....	....	....	A	A	A	A
International	B	A	B	B	B	A	....	....	....	....
Interstate	A	E	A	Arc.	A	Arc.	A	Arc.	....	....
Jackson (2 cyl.)	A	A	....	....	....	....	....	....	....	....
" (4 cyl.)	A	Arc.	A	Arc.	A	Arc.	A	Arc.	Arc.	Arc.
Jeffery	....	....	....	....	....	....	....	....	A	A
Kelly	....	....	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	A	A

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Mobiloils

A grade for each type of motor

MODEL OF CARS	1910		1911		1912		1913		1914	
	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
King	....	....	A	E	A	E	A	E	A	A
Kline Kar	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	A	Arc.
Knox	B	A	B	A	B	A	B	A	B	A
Krit	A	A	A	A	A	A	A	A	A	A
Locomobile	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Lozier	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	A	Arc.
Mack	A	E	A	E	E	E	E	E	A	A
Mack, Jr.	....	....	....	....	....	....	....	....	A	Arc.
Marion	A	E	A	E	A	Arc.	A	Arc.	....	....
Marmon	A	E	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Maxwell (2 cyl.)	E	E	E	E	E	E	E	....	....	....
" (4 cyl.)	E	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
" (6 cyl.)	....	....	....	....	....	....	Arc.	Arc.	Arc.	Arc.
Mercer	A	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.

MODEL OF CARS	1910		1911		1912		1913		1914	
	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Mitchell	Arc.	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Moline	A	E	A	Arc.	A	Arc.	A	Arc.	....	....
Moline Knight	....	....	....	....	....	....	....	....	A	A
Moon (4 cyl.)	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	A	Arc.
Moon (6 cyl.)	....	....	....	....	....	....	....	....	Arc.	Arc.
National	A	A	A	A	A	A	A	A	A	A
Oakland	A	E	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Oldsmobile	A	E	A	Arc.	A	Arc.	Arc.	Arc.	Arc.	Arc.
Overland	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Packard	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	A	Arc.
Paige Detroit	E	E	A	Arc.	A	E	A	E	A	A
Pathfinder	....	....	....	....	....	....	A	Arc.	Arc.	Arc.
Peerless	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Pierce Arrow	Arc.	Arc.	A	Arc.	A	Arc.	Arc.	Arc.	Arc.	Arc.
" Com'l.	....	....	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Pope Hartford	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Premier	A	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Rambler	A	A	A	Arc.	Arc.	Arc.	Arc.	Arc.	....	....
Regal	A	E	A	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Renault	A	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Reo	A	E	A	Arc.	A	Arc.	A	Arc.	A	Arc.
S. G. V.	....	E	B	Arc.	B	Arc.	B	Arc.	A	Arc.
Selden	A	E	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Simplex	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Speedwell	Arc.	Arc.	A	Arc.	A	Arc.	Arc.	Arc.	Arc.	Arc.
" "Mead"	....	....	....	....	....	....	A	Arc.	B	A
Stearns	Arc.	Arc.	A	Arc.	A	Arc.	....	....	....	....
" "Knight"	....	....	....	....	A	A	A	A	A	A
Stevens Duryea	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Stoddard-Dayton	Arc.	Arc.	A	A	A	A	A	A	....	....
" " "Knight"	....	....	....	....	A	A	A	A	....	....
Studebaker	E	E	A	Arc.	Arc.	Arc.	A	Arc.	A	Arc.
Stutz	....	....	....	....	A	A	A	A	A	A
Velie 9-45	A	E	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Velie 9-50	....	....	....	....	....	....	....	....	Arc.	Arc.
Walter	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
White (Gas)	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Winton	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.

New Speed in Billing

This mechanism saves your bookkeeper's time. It foots your bills *as fast as they are typed*

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* * * *

Suppose you have the machine before you.

Press the numeral keys.

Look!

Each type stroke does double duty. *You will see the amounts not only typed, but added.* The two acts are simultaneous.

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Without a single interruption for addition or subtraction your bills are ready to mail.

From this time forward stopping to foot bills and statements, or check totals will be sheer waste of clerical time.

Your totals once entered are as correct as though certified by an expert accountant. * * * *

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Every business purpose which calls for writing and adding on the same page, calls for this latest Remington time-saver.

* * * *

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The initial cost is soon wiped out. The more work you give the Remington Adding and Subtracting Typewriter the quicker it pays for itself.

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It is good for many years of "heavy days" work. * * * *

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You can't begin too soon. Delay simply means more time-waste and error-risk in your office.

Write today to our New York office for booklet, "The New Remington Idea," which describes this remarkable machine in detail.

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Minimum age, 21. Usual salary, $1500 to $1800. Subjects and weights of examination are: Technical 6; Experience 4; 75% required on Technical; 70% on Experience.

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members of the Whymper party were lost and then strode rapidly forward over the snow and ice to the summit ridge. Warily walking along this narrow causeway they at last reached the topmost point, or rather the highest spot which could be trodden in safety, because, as a matter of fact, the snow had been blown by the north wind over the summit to form a big cornice, a fall through which would have landed one into the valley of Breuil 8,000 feet below.

The weather was perfect except for the violent wind. The camera was set up, and with the party holding the operator securely, magnificent panoramas from an elevation of 14,705 feet were obtained. The work of Burlingham was followed with intense interest through the hotel telescopes, by those in Zermatt below, the arrival of the party at the summit having been awaited with suppressed excitement.

Owing to the time occupied in the ascent, work at the summit had to be hurried, and then, the equipment packed away, the descent commenced. Unfortunately this was more difficult than the upward climb, as the Whymper party encountered its tragedy while going down, while in this instance the presence of the wind which was obliterating the ascending tracks, constituted an additional source of anxiety. Careful haste was urgent as time was slipping by. The first part of the journey was completed without incident, but when the "shoulder" was gained extreme care had to be exercised. The weight of the apparatus now became revealed in a striking manner, for it hampered the free movement of the fatigued porters very appreciably. Burlingham, not being familiar with the mountain had one thrill. Descending backward over a projecting rock with a sheer drop of hundreds of feet into the abyss is not an easy acrobatic achievement, and although the operator is an experienced climber, he once got into a serious difficulty. He was going down hand over hand, but presently failed to find a finger hold among the crags. He was dangling over a precipice unable to move forward or backward. He called out desperately to one of the porters. The latter, realizing his perilous situation, hurriedly descended hand over hand, keeping the rope taut, and, at last grasping the helpless operator, hauled him up to a point whence descent might be safely effected.

It was six in the evening, and the party were on dangerous ice banks sloping upward at 80 degrees. Snow began to fall, and it seemed as if a blizzard were about to burst. The leading guide apprehensively urged the party to faster movements or they would all be overwhelmed. While descent thereupon was accelerated, no long chances were taken in the bad places, although it was only due to the expert assistance available that no accidents occurred. When at last the club hut was gained it was almost dark, and, as a pall of clouds shrouded the mountain below them they realized that the last pull to the *Cabine* below would be fraught with extreme risk. They were too tired to eat the food they had left in the hut in the morning, and without any untoward delay, they continued their downward way over the ragged crags. Presently they caught sight of the lights in the *cabine*, and at 9:15 entered its welcome door, after having been climbing continuously for 18¾ hours. At Zermatt the crowds had grown anxious. The snow-fall on the peak had been observed, and as darkness had overtaken the expedition, became apprehensive of its safety.

When the party, practically played out, entered Zermatt, after having been absent for nearly three days, the guides acknowledged that it was the most difficult enterprise with which they had been associated in connection with the Matterhorn. As for the operator, Frederick Burlingham, he was completely satisfied. He had kinematographed the Matterhorn from Zermatt to its crest upon 1,500 feet of film, which upon subsequent development proved perfect in all its essential qualities, and conveys to the masses some of the finest impressions of the Matterhorn, which ever have been secured. The suc-

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1915

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cess of this expedition prompted Burlingham to repeat his performance upon Mont Blanc, but the highest peak in Europe being easier to climb than the Matterhorn, greater interest is attached to the latter. His movies thereof appeal to mountaineers and are possessed of distinct educational value, while the achievement is one of the most brilliant in the history of kinematography.

The 200 Horse-power Curtiss Motor for the Rodman Wanamaker Transatlantic Flyer

THE 200 horse-power aeronautical motor for the Rodman Wanamaker transatlantic flyer was given a five-hour run at moderate speed recently, and is said to have behaved well. As the motor had had but little limbering under shop power it has been thought advisable to keep the speed below 1,100 revolutions per minute for the first few days, but even at that speed the nine and one half foot experimental propeller shows a static thrust of more than 800 pounds.

The motor is of the Curtiss V-type, eight cylinders, with a bore and stroke of five by seven inches. The cylinders are individual, with welded water jackets of noncorrosive Monel metal. Each cylinder has four tungsten steel valves two and one fourth inches in diameter with seven sixteenths inch lift. All thirty-two valves are operated from a single camshaft. The cylinders are held down to the crankcase by tubular studs from the heads with extension bolts passing through main bearing caps. All the outside bearings are self-lubricated with graphite.

The crankcase is composed of two aluminium castings, thoroughly bridged. The crankshaft is four feet long, two and one fourth inches diameter, and is drilled with an oil duct one and one sixteenth inches diameter. It is made of imported Krupp steel. The connecting rods are I-type forgings with large bearings and oil ducts leading to the piston pins.

Water is circulated by large centrifugal pumps with double outlets. The cylinder heads and valve seats are water cooled, and the exhaust valve stems are water cooled for almost their entire length.

Three rotary gear pumps take care of the lubricating system. One large pump drives the oil under high pressure to every bearing through the main shaft, cam shaft and connecting rods; while two smaller pumps keep the lower half of the case drained. No splash system is employed, the idea being to eliminate the waste of oil and danger of flooding the cylinders should the machine assume an unusual angle.

The gasoline intake manifolds are two and one half inches in diameter and are water jacketed. Ignition at present is by two-spark magneto, but this may be replaced later by two single spark instruments of the half-speed induction type.

The Next Road Congress

THE fourth American Road Congress, and the convention of the American Highway, all its affiliated organizations, and the American Automobile Association, have been scheduled for Atlanta, Ga., durthe week beginning November 9th, 1914.

This announcement, which has been awaited by the various organizations working for better roads, was made in Washington by J. E. Pennybacker, secretary of the American Road Congress. The convention city was selected some time ago, but the date was left open until Mr. Pennybacker made definite announcement in Washington.

It was also announced that in addition to the road organizations, committees of the American Bar Association and the American Bankers' Association would work in conjunction with the American Highway Association to make the fourth road congress crystallize the movement for more uniform road laws and a better system of financing road improvement throughout the country.

This will be the first meeting of the American Road Congress in the South, and is a recognition of the great energy and progress that has been made in that sec-

The Spirit of Service

WHEN the land is storm-swept, when trains are stalled and roads are blocked, the telephone trouble-hunter with snow shoes and climbers makes his lonely fight to keep the wire highways open.

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This spirit of service is found in the recent rearrangement of the telephone business to conform with present public policy, without recourse to courts.

The Bell System has grown to be one of the largest corporations in the country, in response to the telephone needs of the public, and must keep up with increasing demands.

However large it may become, this corporation will always be responsive to the needs of the people, because it is animated by the spirit of service. It has shown that men and women, co-operating for a great purpose, may be as good citizens collectively as individually.

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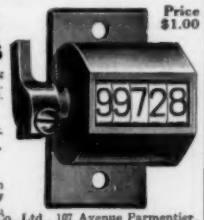

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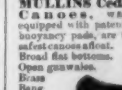

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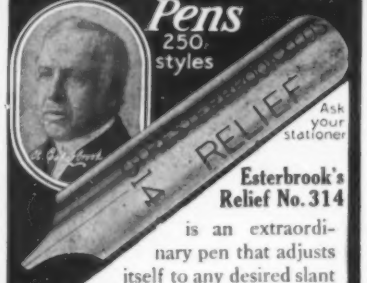

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tion in the movement for improved roads. In 1913, about $40,000,000 was expended by southern States on their public roads, in addition to the labor of thousands of State convicts. Georgia alone had her entire convict force, numbering nearly 5,000, engaged in road construction.

The tremendous importance of guarding against extravagance in road expenditures is shown by the fact that while a recent report of the Census Bureau indicates that the total bonded debt of the forty-eight States last year was $419,157,000, in the single year of 1912 the States spent about $142,000,000 on roads. The total indebtedness had been accumulating for years, and yet in one year an amount equal to about one third was spent on roads. This subject will be dealt with exhaustively at the coming congress.

One of the principal results hoped for by the management of the congress will be the establishment of State highway departments in the six southern States which have thus far failed to adopt the plan of State supervision, namely Georgia, South Carolina, Florida, Tennessee, Mississippi, and Texas. Aside from these six States only Indiana and Montana have failed to establish State highway departments for educational or constructive work.

The 1913 American Road Congress was held in Detroit, Mich., with an attendance of about 4,000, representing forty-four States, and with a vast array of exhibits, in which the United States Government, many of the States, educational institutions, and over one hundred manufacturers participated. This year it is expected that the congress will have an attendance well over 5,000, and in preparation for the exposition to be held in connection with the congress, under the direction of Charles P. Light, business manager, the city is preparing to erect temporary structures covering the entire street space on both sides of the auditorium, and to close to traffic, during the entire congress, a viaduct extending two blocks. Steps are now being taken toward securing favorable railroad rates and committees are being formed to provide for the comfort and entertainment of the congress which will include many of the most distinguished men of the nation.

Stresses in Railroad Tracks

A SUB-COMMITTEE has been appointed by the American Society of Civil Engineers to co-operate with a similar committee of the American Railway Engineering Association to conduct tests on stresses in tracks. The members of this committee are as follows:

A. N. Talbot, Chairman; A. S. Baldwin, J. B. Berry, G. H. Bremner, John Brunner, W. J. Burton, Charles S. Churchill, W. C. Cushing, E. Gerber, George W. Kittredge, William McNab, G. J. Ray, F. E. Turneaure, J. E. Willoughby.

The Railway Engineering Association appointed a special committee consisting of the men named in the above and in addition thereto the following:

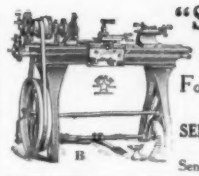
W. M. Dawley, Vice-chairman; H. E. Hale, Dr. P. H. Dudley, J. B. Jenkins, P. M. LaBach.

The first meeting of this committee was held at the Congress Hotel, Chicago, during the annual meeting of the Railway Engineering Association, March 17th to 20th, 1914.

A sum of $10,000 has been subscribed by the U. S. Steel Corporation to defray the expenses of this investigation, and this sum has been supplemented with $2,000 by the American Society of Civil Engineers.

Murder of an American Botanist

A MELANCHOLY postscript must be added to the note published in the SCIENTIFIC AMERICAN of December 13th, 1913, describing the unique expedition to Amboina, Dutch East Indies, undertaken by Dr. Charles Budd Robinson of the Philippine Bureau of Science. Press dispatches report that the explorer was murdered by natives soon after his arrival in the island. Dr. Robinson was a Canadian by birth, but was partly educated in the United States, and was at one time on the staff of the New York Botanical Garden.



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The Announcement that The Cadillac Company Has No Intention of Marketing a Six Cylinder Car has Produced a Profound Impression

The confidence which is reposed in the Cadillac Company is much more than a mere compliment.

It is an important trust—a grave responsibility.

Motorists by the thousand wait to see what action the Cadillac Company will take in matters of motor car design and development.

That great army of owners, in particular, who have invested more than one hundred and thirty millions ($130,000,000) of dollars in Cadillac cars, accept the decision of this company, for or against a principle of construction, as authoritative and final.

That is why the announcement that the Cadillac Company has no intention of marketing a six cylinder car produced such a profound impression.

It was natural that Cadillac owners, present or prospective, should wait for word on the subject from this company, and it was equally natural that, having received this word, they should immediately and unanimously accept it as conclusive.

How widely the assumption had been traded upon was indicated by the immediate effect everywhere.

Hundreds who had been waiting for word from the Cadillac Company, have bought Cadillac cars since the announcement appeared.

The statement that the company had thoroughly experimented with the six cylinder—as it had with the one, with the two and with the three cylinder—and the announcement of the verdict, was enough.

Under the circumstances it seems to us permissible to remind our friends of an important fact.

We would like to remind them again that the Cadillac Company has seldom found it wise to look to others for guidance.

Rather, it has found that greatest wisdom lay in proving for itself what is best in principle and most practical in application.

The Cadillac was first to produce a practical, enduring motor car. How practical it was, how enduring it was, the whole world knows, since these eleven years old cars are still in service.

The Cadillac was first to produce a high grade car to sell under $2000.

The Cadillac was first to evolve a four cylinder engine, the correctness of whose principles in their entirety, have proven incontestable after ten years of service.

The Cadillac was first to inaugurate the electrical system of automatic cranking, lighting and ignition.

The Cadillac was first to make practical in large production, the two-speed direct drive axle.

None of these were forced upon us.

They were all evolved in the natural course of Cadillac development.

Cadillac principles are the same today as ten years ago—only they have developed progressively, logically, step by step.

The tree has grown and flowered and flourished—but it is still the same tree.

The history of automobile manufacture is a history of change—often a bewildering succession of contradictory changes, made in a vain effort to interpret the trend of popular demand, or a disposition to follow what appear to be the lines of least resistance.

The Cadillac Company has never shifted, never retraced its steps, never advocated a vital principle which it was afterward compelled to repudiate. The Cadillac is discussed in almost every sale of a motor car, except sales of lowest price. It is almost invariably held in mind as a pattern, a standard, a criterion or an ideal.

Those who drive the car cannot be dislodged from their allegiance. They are positive and determined, ofttimes to the point of stubbornness.

They will hear no slighting comments on the car without resentment. They will concede no higher degree of engineering authority. They will accept no principle as best unless that principle be endorsed by the Cadillac.

That is precisely because the Cadillac has been scientifically progressive—but not impulsive or fickle.

It is precisely because the Cadillac has inaugurated instead of followed.

The Cadillac Company believes the Cadillac car to be immeasurably superior.

The Cadillac Company knows the riding qualities of that car with its two-speed axle, to be inimitable and unique.

The Cadillac Company believes that in all of those qualities which make for supreme satisfaction, for economical operation and maintenance, for constant and enduring service, day-in-and-day-out and year-in-and-year-out in the hands of the every-day user, the Cadillac stands pre-eminent.

And Cadillac owners share in these beliefs.

If they elected to wait for pronouncement of Cadillac policy in regard to the six cylinder car, it was not from lack of confidence, but the exact opposite.

It was one of the highest compliments ever paid the Cadillac Company.

And the Cadillac Company having spoken, the case is closed for every Cadillac owner, present or prospective.

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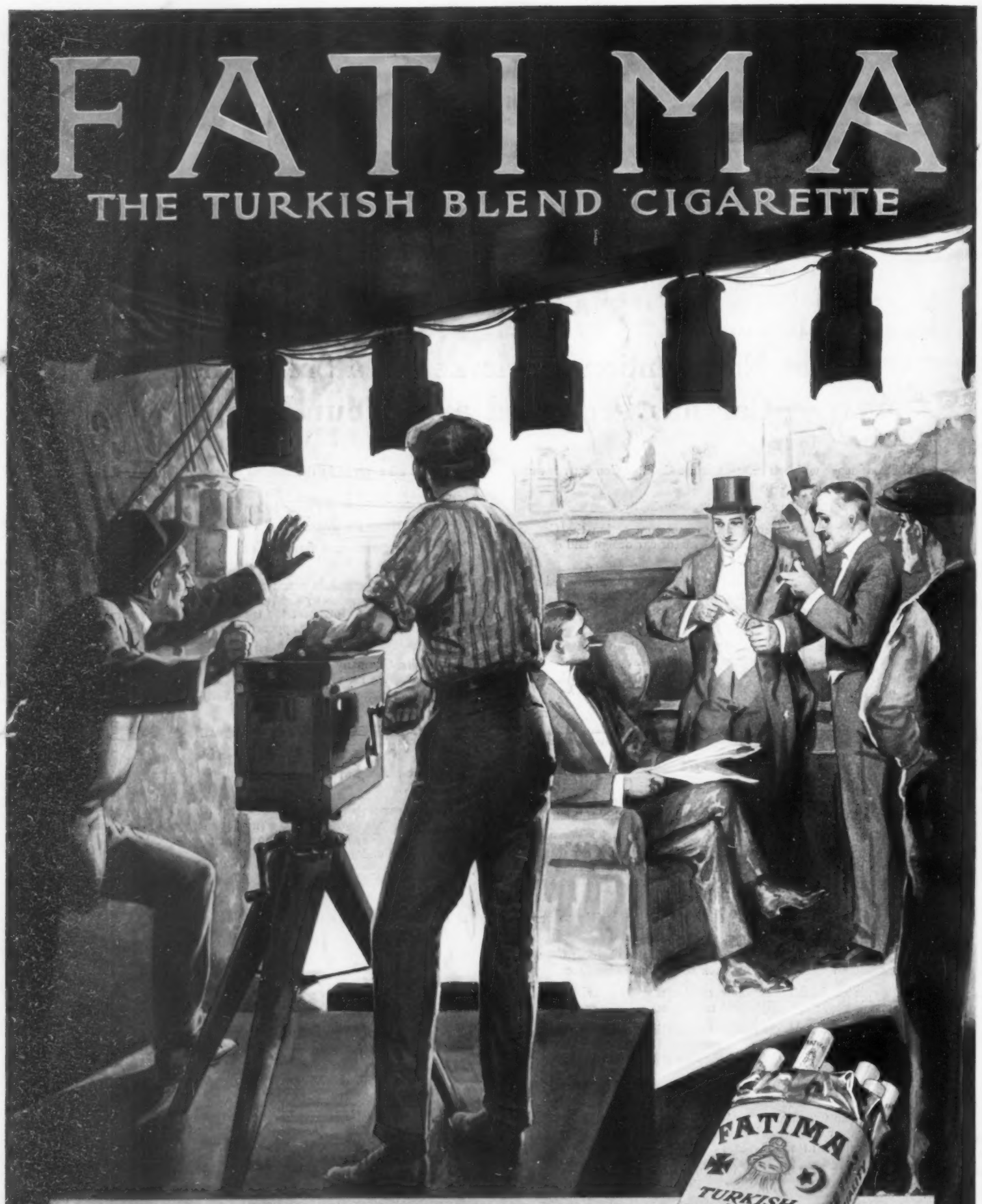

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